The Construction of Shared Knowledge through Asynchronous Dialogue

Thesis

The construction of shared knowledge through asynchronous dialogue

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Abstract

This thesis investigates how groups of learners use asynchronous dialogue to build shared knowledge together over time. To do this, it takes a sociocultural approach, with a situated focus on learners' social and temporal settings as well as on the tools they employ. It utilises concepts developed to support understanding of knowledge co-construction in face-to-face environments, particularly the social modes of thinking identified by Mercer and his colleagues (Mercer, 1995, 2000, 2002; Mercer & Littleton, 2007; Mercer & Wegerif, 1999) and the improvable objects described by Wells (1999).

Analysis shows that, over short periods of time, groups of learners construct shared vocabulary, history and understanding slowly through the use of a series of discursive devices including those identified here as 'constructive synthesis', the 'proposal pattern' and 'powerful synthesis'. Over longer periods they may engage in 'attached dialogue', a form of asynchronous dialogue that is mediated by improvable objects. The development of these improvable objects involves learners engaging in exploratory dialogue that builds into progressive discourse, a coordinated form of co-reasoning in language. While doing this, they actively work to avoid unproductive interaction by consistently shifting responsibility from the individual to the group.

Previous studies have suggested that asynchronous dialogue may act to limit learners to cumulative exchanges (Littleton & Whitelock, 2005; Wegerif, 1998). The analysis over time presented here shows that asynchronous exchanges are enriched by the use of textual affordances that are not available in speech. In the case of attached dialogue, groups of learners are prompted to share knowledge, challenge ideas, justify opinions, evaluate evidence and consider options in a reasoned and equitable way. They do this more successfully when their co-construction of knowledge is not solely task-focused but also focuses on tool use and on the development of social knowledge about the group.

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Daniel, Miriam, Bethany and Jacob. I've typed the final words, I've wrestled with the appendices, the headers, the bibliography and the printer – I'm heading home.

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1 Introduction

1.1 Research aims

In the first five years of this century, the number of Internet users in the UK almost doubled, rising to 37.8 million in 2005 (CIA, 2001, 2006). For the first time, the majority of the population was able to interact, and to learn together, in virtual settings (Dutton, di Gennaro, & Millwood Hargrave, 2005). As a result, some learners and teachers who have spent years developing the skills necessary to communicate, work and build knowledge together in face-to-face settings face the challenge of adapting those skills for use in an asynchronous, textual environment.

The primary aim of this thesis is to increase understanding of the skills and meaning-making tools that support the shared construction of knowledge in asynchronous settings. To do this, it investigates the ways in which online learners construct knowledge together in both the short and the long term without being co-present at the same time or in the same place. Its central research question is therefore:

- How do groups of learners use asynchronous dialogue to build shared knowledge over time?

In order to answer this question, the study examines the interrelationship between online learning and its contexts, and considers the characteristics of these contexts. It relates the asynchronous learning dialogue that takes place in online conferences to previous studies of classroom talk. In doing so, it investigates the utility in a text-based environment of

analytic tools developed for the study of speech. In particular, it relates 'social modes of thinking' through talk (Littleton & Whitelock, 2005, p151) to the ways in which learners think together through asynchronous dialogue.

This research draws on the sociocultural understanding that new skills and ideas are not individual achievements, but are developed, carried forward and passed on through interaction and collaboration. Collaboration between learners involves the use of meaning-making tools, including language and, more specifically, forms of dialogue that can support social modes of thinking. Use of these tools is influenced by the aims, feelings and relationships of their users (Wells & Claxton, 2002a). These socio-affective factors change over time, as do collaborators' access to and ways of using their tools. In order to understand these factors, the analysis described in this thesis is situated in that it takes into account the social, emotional and temporal settings of learners.

1.2 Previous research on joint knowledge construction

'Knowledge' is related to the verb 'to know', a verb which 'now covers the ground formerly occupied by several verbs, and still answers to two verbs in other Teutonic and Romanic languages' (OED, 1989). It has a long history, both as a noun and as a verb. Educational theorist Vygotsky treated it as a noun when he observed that 'we utilize concepts to acquire knowledge about facts… we utilize facts to acquire knowledge about concepts' (Vygotsky, 1997c, p251), but his work on the social aspects of learning and on the growth of knowledge through the joint development and systematisation of concepts encouraged the development of an understanding of learning and of knowledge as participatory activities. Lave and Wenger developed this understanding when they moved towards a view of the mastery of knowledge as a process that could be represented by verbs rather than nouns. In their studies of learning as a situated activity, they showed that 'learners inevitably participate in communities of practitioners and […] mastery of

knowledge and skill requires newcomers to move towards full participation in the sociocultural practices of a community' (Lave & Wenger, 1991, p29).

Sfard (1998) describes these two representations of knowledge as the 'acquisition metaphor' and the 'participation metaphor'. She notes that

> Since the time of Piaget and Vygotski, the growth of knowledge in the process of learning has been analyzed in terms of concept development. Concepts are to be understood as basic units of knowledge that can be accumulated, gradually refined, and combined to form ever richer cognitive structures. (Sfard, 1998, p5)

Sfard describes this as the acquisition metaphor, and notes that it differs from the participation metaphor, which conceives of learning a subject as 'a process of becoming a member of a certain community' (Sfard, 1998, p6). She observes that neither metaphor is wholly fitted to its purpose. For example, although in 1988 Lave described the idea of knowledge transfer as 'seriously misconceived' (Lave, 1988, p39), reflection with her colleague, Wenger, later caused her to ask 'How can we purport to be working out a *theoretical conception* of learning without, in fact, engaging in just the project of abstraction rejected above?' (Lave & Wenger, 1991, p38). Thus, although 'bodies of knowledge' vanish like a mist under close examination, even researchers who deny the possibility of knowledge transfer, engage in writing books and theses and, by editing and correcting these, strive to make them an accurate representation of knowledge.

This thesis associates knowledge with learning. It takes knowledge to be the ever-changing product of the learning process; humans' way of making sense of the world together using psychological tools such as language, art, images and symbols. It counts among these tools the representations of understanding, such as books and articles, which individuals and groups utilise in an attempt to preserve their current understandings for the use of others.

To understand how online learners build knowledge together over time, this thesis brings together two distinct lines of research. The first of these involves communication through

asynchronous dialogue and the affordances offered by this medium. The second is concerned with the investigation, from a sociocultural perspective, of how learners construct knowledge together over time. To date, the majority of studies that consider this issue have been carried out in face-to-face settings.

Asynchronous dialogue is defined here as a sustained discussion, involving two or more people whose contributions are not expected to be produced in temporal proximity, in which language is one of the elements used to convey meaning. In a learning environment, dialogue is ideally, but not always, a positive interaction, which is purposeful and valued by those who take part, and which may provide opportunities for productive interaction and the co-construction of knowledge.

Asynchronous dialogue offers learners a variety of affordances. The term 'affordance' was introduced by Gibson (1966) in the context of environments to describe 'what things furnish, for good or ill' (p285). Because a 'total environment is too vast for description' (Gibson, 1986, p36), he recommended a focus on distinct features, including tools. The term has since been used in a variety of ways (Boyle & Cook, 2004), sometimes with an emphasis on the designed uses of a tool or other artefact (Salomon, 1993). For example, a design-centred analysis of the affordances of a fire extinguisher would focus on its utility in cases of conflagration, while the wider focus on possible functional affordances adopted here would also draw attention to its utility as a heavy weight for wedging open fire doors.

This thesis is concerned with functional, rather than designed, uses of tools and follows Conole and Dyke (2004a, 2004b) in considering affordances to refer to 'the perceived and actual properties' of asynchronous dialogue, 'primarily those fundamental properties that determine just how [it] could possibly be used' (Norman, 1998, p9). In an educational setting, affordances offer advantages to learners but are also associated with constraints that may limit learning or act as barriers to it (Conole & Dyke, 2004b). Walther suggests

that the advantages and constraints of online communication change over time and that studies can therefore provide only a limited understanding of these affordances if they do not consider longer-term impact (Walther, 1996).

Studies of communication through asynchronous dialogue that are particularly relevant to this study include Walther's work (Walther, 1996, 1997; Walther & Tidwell, 1995) on the importance of temporal context to online interaction and Herring's (2003, 2005) examinations of how coherence is achieved and maintained in asynchronous dialogue. Among the many studies of learning in asynchronous environments, Lapadat's long-term studies of asynchronous groups of learners (Lapadat, 2000, 2002, 2007) have been particularly helpful because of her detailed accounts of how learners work together.

In addition to studies of the affordances of asynchronous dialogue, this thesis also builds on a body of work that is concerned with the study of how learners build knowledge together over time. Sociocultural studies of asynchronous conference data by Wegerif (1998) and Littleton and Whitelock (2004) inspired the selection for this research of an analytic framework originally developed for study of the co-construction of knowledge in face-to-face settings. This analytic framework is based on extensive work by Mercer and his colleagues (Mercer, 2000, 2002; Mercer & Littleton, 2007; Mercer & Wegerif, 1999; Mercer, Wegerif, & Dawes, 1999; Wegerif, 1996; Wegerif & Mercer, 1996). This programme of research identified three social modes of thinking employed in the classroom: disputational, cumulative and exploratory talk.

These categories focus attention on learners' use of talk as a thinking tool. Disputational talk is therefore to be discouraged when the aim is collaboration, because it is unproductive for groups of learners. It is characterised by individuals trying to take control; restating their own point of view while rejecting or ignoring the views of others. Cumulative talk is potentially more constructive; control is shared and speakers build on each other's

contributions, adding their own information and constructing a body of shared knowledge and understanding, but they do not challenge or criticise each other's views.

Exploratory talk is more characteristic of an educated discourse because it involves constant negotiation. Reasons and explanations are made explicit where necessary and all participants make critical evaluations in order to reach joint conclusions. Extensive work by Mercer and his colleagues (brought together in Mercer & Littleton, 2007) has shown that, in classroom contexts, exploratory talk can be employed by teachers and taught to students, thus producing measurable improvements in their learning achievements.

These studies of how learning is achieved through classroom talk underpin the understanding presented in this thesis of how learning is accomplished through asynchronous dialogue. That understanding is supported by Wells' (1999) analysis of how groups develop ideas together over time through the use of improvable objects. These are discussed in detail in Section 2.20, and can be briefly summarised as knowledge artefacts that participants work collaboratively to improve because they involve a problem that requires discussion. Understanding of how learning is accomplished through asynchronous dialogue is also supported by Wells' (1999) identification of a progressive form of discourse, by Lemke's (2000, 2001, 2002) studies of the co-construction of knowledge over different time scales, and by Jones and Issroff's (2005) consideration of the importance of social and affective issues to learners.

Together, these lines of research from online and face-to-face contexts indicate that users of asynchronous forms of dialogue such as email and online fora make use of various structures and patterns, referred to here as discursive devices, within their communication in order to increase both coherence and comprehension. Previous research also suggests that, if building knowledge together online is related to the offline experience of knowledge construction, asynchronous learners are likely to employ improvable objects as

well as some of the characteristic elements of cumulative and exploratory talk. In addition, employing characteristic elements of disputational talk is likely to hamper groups' ability to build knowledge together.

As in face-to-face situations, the specific devices employed, and the ways in which this is done, are likely to vary over time according to participants' understanding of what they are doing and the social and affective circumstances in which they are doing it. The answer to the main research question 'How do groups of learners use asynchronous dialogue to build shared knowledge over time?' is therefore dependent on the context of the learners.

Asynchronous educational dialogue has no single context that can be objectively identified and described. Participants' physical and social contexts are not evident unless they actively work to share and understand these. It is not necessarily clear who is participating in the dialogue, who is attending but not contributing, and who has left or never arrived. Each participant experiences different time gaps between conversational turns, and each participant may access these turns in a different order. Every participant experiences the dialogue in a different physical, social and temporal context, and these contexts affect their understanding of what has been communicated. This research is therefore concerned with the multiple contexts within which asynchronous educational dialogue takes place and with how these multiple contexts are aligned over time to allow shared construction of knowledge to take place.

Because previous studies demonstrated the importance of the social and temporal context of learning, the main research question is addressed through three subsidiary research questions. The first of these focuses attention on the development of knowledge over short periods of time – typically minutes, hours or days:

- How do groups of learners co-construct shared knowledge by building links across postings in asynchronous dialogue?

The second question widens the focus of the research to take into account the construction of social knowledge over both short and long periods of time. In order to investigate social and affective elements of this process, it asks:

- How do groups of learners, working together in asynchronous environments, negotiate and attempt to avoid unproductive interaction?

The final research question is concerned with how groups develop their knowledge over extended periods of time and with the methods they use both to introduce the ideas of others to the group and to share the group's work with the wider community:

- How do groups of learners preserve and utilise elements of asynchronous dialogue over periods of weeks or months in order to develop their understandings?

1.3 Data collection

To answer these questions, and to investigate how groups of learners use asynchronous dialogue to construct shared knowledge together; this research included the assembly of a data corpus collected from groups of undergraduate learners who spent time collaborating in an asynchronous environment in an educational setting. This data corpus consists of an extensive set of material in which three separate groups of university students with no face-to-face contact collaborated online using FirstClass conferencing software.

An initial, pilot study was carried out, involving secondary analysis (Glass, 1976) of a similar data corpus collected by other researchers. Following the model of earlier studies of asynchronous conference data (reviewed in Rourke, Anderson, Garrison, & Archer, 2003), this pilot study employed content analysis to investigate the co-construction of knowledge by small groups of learners. The pilot study and its implications for the methodology of the main study are considered in Chapter 3.

Within the six-week online conferences from which the data for the main study were gathered, small groups of undergraduate psychology students at The Open University, with the support of tutors, developed and carried out research projects. At the end of these six-week periods of collaboration through project conferences, groups of learners presented their work to others on the course and received feedback intended to support them in their subsequent coursework. Participation in the group work was assessed and learners could not pass the course without taking an active role within their group.

Three six-week FirstClass conferences were archived in their entirety for this research. The data archived included the text and title of all messages posted in the conference, together with the names of their authors and the dates and times when they were posted. It also included any documents or icons attached to the postings and, in order to preserve visual elements, screen captures of all the messages. The history of each posting was also recorded, showing who had created it and when, who had opened it and when they had first done so, who had downloaded its attachments and when they had done this.

The conference postings were an obvious element of asynchronous dialogue, but the conferences also contained discussion mediated by attached documents, summaries or logs of the groups' rare synchronous discussions; reports on synchronous conversations with people outside the groups; and occasional references to personal messages or emails.

The archived conferences provided detailed evidence of the ways in which tutors and learners used asynchronous dialogue. However, conference data provided only limited evidence of the reasons for and the thinking behind participants' actions. The public face of conference activity was visible in the postings, while private opinions and reflections were masked or entirely hidden. To enrich the data, asynchronous one-to-one interviews mediated by information technology, otherwise known as epistolary interviews (Debenham, 2001, 2007), were carried out with students and tutors on the course.

Thematic analysis of these interviews was employed to identify commonly expressed themes that were not apparent, or scarcely apparent, in the conference data.

1.4 Data analysis

While thematic analysis was applied to the interview data, study of the conference data involved a synthetic approach, bringing together elements of visual analysis and sociocultural discourse analysis. The pilot study (see Chapter 3) showed that content analysis was not an appropriate method of addressing the research questions, so this form of analysis was not employed in the main study.

Recent research into the construction of knowledge through dialogue has successfully employed sociocultural discourse analysis to analyse transcriptions of dialogue in the classroom (see, for example, Mercer, 2004; Mercer, Littleton, & Wegerif, 2004). This is a form of discourse analysis that was developed in order to analyse how spoken language is used as a group tool. It is concerned with the content and function of talk, with its cohesive nature and with the ways in which shared understanding is developed over time in a social context (Mercer, et al., 2004). To achieve this, it combines detailed analysis of talk in specific events with comparative analysis of dialogue across a sample of cases. This method retains data as a whole for analysis, so is particularly suitable for the analysis of talk in a temporal context and for the study of the complex relationships between interactions that occur at different times.

A limitation of this form of analysis is that it does not typically deal with visual elements. These aspects of conference data require analysis of the composition of the dialogue alongside its content. Asynchronous dialogue, like written text, is typically both verbal and visual, with much of its meaning carried by visual features, including layout and typographical elements. In the case of such composite texts, with meanings realised through different semiotic codes, Kress and van Leeuwen (2006) demonstrated that visual

and verbal elements interact, and should be analysed as an integrated whole. Their semiotic approach drew attention to the syntax of images as a source of representational meaning. This led them to identify a set of structuring principles that enable viewers to make sense of the layout of text and images: salience, perspective, balance, frames, vectors and reading paths. These principles form the basis of a set of closely related methods of visual analysis, which have been employed to analyse diverse forms of data including combinations of images and words (Jewitt & Oyama, 2001), drawings, paintings, posters, film and television (van Leeuwen & Jewitt, 2001).

These structuring principles, which are described in more detail in Chapter 4, are used in this research to understand the visual elements of the conference data and to relate them to the verbal elements. This visual analysis is used to understand how learners utilise elements of colour, typography and layout to structure and make sense of their discussion, and to build knowledge together.

1.5 Structure of the thesis

The current chapter has provided an introduction to the main aims, approaches and concerns of this thesis. In so doing, it has established its sociocultural perspective and located this research in relation to previous studies of asynchronous dialogue and of the co-construction of learning.

Chapter 2: Literature review

The next chapter locates this thesis more firmly within the existing literature, reviewing the previous theoretical and empirical work on which it is based. In particular, it considers the sociocultural perspective on learning, which draws attention to its social and temporal nature; previous work on distance education and interaction, different forms of computer-mediated communication, and educational dialogue in face-to-face and online settings. It

also provides detailed accounts of key analytic concepts, including asynchronous dialogue, improvable objects and cumulative, disputational and exploratory talk.

Chapter 3: Methodology: pilot study

This chapter describes the pilot study, showing how this influenced the methodology of the main study. The chapter also includes a detailed discussion of the ethics of Internet research, showing how different conceptualisations of the online environment affect decisions relating to ethics.

Chapter 4: Methodology: main study

The fourth chapter focuses on the data corpus: its selection, collection and rationale. Epistolary interviewing, a relatively new research method, is described and its advantages, disadvantages and ethical concerns are considered. The chapter goes on to identify the analytic framework and stance of the research and to explain the choice of sociocultural discourse analysis, visual analysis and thematic analysis as tools.

Chapter 5: Co-construction of knowledge over short periods of time

The first analysis chapter addresses the question 'How do groups of learners co-construct shared knowledge by building links across postings in asynchronous dialogue?' It considers how groups build links within their dialogue, and the discursive devices that help them to do this. It also investigates the challenges faced by these groups.

Chapter 6: Negotiation and avoidance of unproductive interaction

The second analysis chapter asks 'How do groups of learners, working together in asynchronous environments, negotiate and attempt to avoid unproductive interaction?' It investigates whether groups' temporal and social contexts lead them to engage in unproductive interaction. It goes on to explore the strategies and tools that learners employ

in their discourse to support group work, and the problems and challenges that these provide. It also identifies issues that could give rise to disputational dialogue.

Chapter 7: Co-construction of knowledge over extended periods of time

The final analysis chapter addresses the question, 'How do groups of learners preserve and utilise elements of asynchronous dialogue over periods of weeks or months in order to develop their understandings?' It considers whether asynchronous groups of learners make use of improvable objects and whether such objects promote the use of exploratory dialogue and progressive discourse. It goes on to investigate how these objects and forms of dialogue can support the development of shared knowledge over long periods of time.

Chapter 8: Discussion and conclusion

The final chapter employs the findings reported in Chapters 5 to 7 in order to answer the main research question, 'How do groups of learners use asynchronous dialogue to build shared knowledge over time?' It then considers how successful the research has been in fulfilling its aims and goes on to identify its theoretical, practical and methodological contribution before outlining an agenda for future research.

2 Literature review

2.1 Introduction

This chapter reviews the existing theoretical and empirical work on which the research is based. It demonstrates that learning is fundamentally social in nature, even when individuals are separated by time and space, and that knowledge is co-constructed by learners whose understandings are mediated by meaning-making tools such as language. This sociocultural approach builds on the understandings of Vygotsky, and the chapter therefore begins with a consideration of relevant elements of his work on learning.

The sociocultural perspective is then related to studies of distance education and interaction, and to the communication technologies that mediate this, particularly different forms of computer-mediated communication. The meaning-making tool on which this thesis is focused, asynchronous dialogue, is covered in detail, including the importance of social and temporal factors to participants. This form of dialogue is also related to educational exchanges in both face-to-face and online settings.

With attention focused on asynchronous dialogue and the co-construction of knowledge, gaps in the literature are identified, showing the relevance of the research questions answered by this thesis. The chapter concludes with detailed accounts of key analytic concepts used to answer these research questions, including improvable objects and cumulative, disputational and exploratory talk.

2.2 The social nature of learning

Vygotsky (1896-1934) studied human cognitive development, producing a series of compelling and authoritative accounts of learning. His descriptions of the links between social and historical processes and individuals' mental processes form the basis of both social constructivist pedagogy and the sociocultural approach to the analysis of learning. He argued that human consciousness is associated with the use of tools, especially with psychological tools, such as language, which mediate contact with the world (Wertsch, 2007, p85). These tools produce quantitative improvements in terms of the speed and efficiency of human development; they also produce qualitative transformation because mediated contact with the world provides humans with the means to control and organise their behaviour rather than be buffeted by external stimuli (Holland & Lachicotte, 2007).

Vygotsky stressed the social nature of learning. He showed how concepts are constructed through human interaction, distinguishing everyday spontaneous concepts from structured scientific concepts. Everyday concepts are those developed spontaneously by imitating what a more competent person demonstrates in social situations. They are not part of an integrated system of knowledge, but are connected to family and community life and related to experience with objects. Scientific concepts, on the other hand, are appropriated in relation to other concepts within a system of knowledge and are often acquired in a formal setting where learning activity is based on conscious orientation to instruction based on linguistic communication. These concepts are generalisable, which means it is possible to be consciously aware of them, to reflect upon them and to make deliberate use of them (Vygotsky, 1987b). Although Vygotsky's binary division of concepts has since been challenged (see, for example, Nelson, 1974, who argues that everyday concepts are also acquired within a system of knowledge), the importance of the social setting to learning remains clear.

The importance of the social is also clear in Vygotsky's accounts of the development of higher mental functions. Low-level mental processes, such as elementary perception and attention, are present from birth. However, it is necessary to account for human development of higher-level mental functions, including verbal thought, logical memory, selective attention and reasoning. Vygotsky did not produce a rigorous description of such functions, but they were defined after his death by Luria, one of his fellow researchers, as 'complex reflex processes, social in origin, mediate in structure, and conscious and voluntary in their mode of function' (Luria, 1966, p32). Vygotsky repeatedly reworked his description of how individuals develop higher-level mental functions. A commonly cited formulation is his 'general genetic law of cultural development', which states that:

> every function in the cultural development of the child appears on the stage twice, in two planes, first, the social, then the psychological, first between people as an intermental category, then within the child as an intramental category. (Vygotsky, 1997a, p106)

Although Vygotsky framed this law in terms of children, it can be applied to situations involving a learner and a more experienced other (Ravenscroft, Wegerif, & Hartley, 2007). First approaches to a new cultural task typically involve intermental development, social interaction and negotiation between expert and novice or among novices. It is by participating in this social interaction that interpretations are proposed, worked out and, become available to be taken over by individuals and used intramentally. Communication and social contact are thus of great importance to human development, and these forms of social interaction are mediated by psychological tools (Vygotsky, 1997d).

In 'The Instrumental Method in Psychology', Vygotsky clarified his understanding of psychological tools. These tools do not develop organically but are artificial formations, produced in a social setting, and directed towards the development and control of mental processes. Examples include 'language, different forms of numeration and counting, mnemotechnic techniques, algebraic symbolism, works of art [and] writing' (Vygotsky,

1997d, p85). Such tools modify the course and structure of human mental functions, just as physical tools modify the course and structure of physical labour. It is by using psychological tools that individuals become conscious and gain control of their mental abilities. Vygotsky regarded language as the most powerful of these mediating tools and as the primary tool for thinking, and his work on both speech and writing is considered later in this chapter (Section 2.8).

Although Vygotsky wrote extensively on the development of the higher mental functions, he was aware that studying these functions in isolation divorced them 'from the full vitality of life, from the motives, interests, and inclinations of the thinking individual' (Rieber & Carton, 1987, p50). He argued that affective and intellectual processes form a unity, and that no idea is entirely without affective content. Although his English editors' view was that Vygotsky sought 'a new unit of analysis where intellect and affect are fused in a unified whole' (Rieber & Carton, 1987, p373), he did not explicitly develop his ideas on the links between affect and intellect in any depth. Nevertheless, by linking the two, and by his emphasis on the social context of development, he inspired later researchers to investigate these links further (Mahn & John-Steiner, 2002).

Vygotsky's work highlighted both the social nature of learning and the importance of interaction to development. Both have important implications for distance education, which is characterised by the near permanent physical separation of teacher and student and which, before the development of computer-mediated communication, could also be characterised by the near permanent absence of the learning group (Keegan, 2002). Keegan's description does not imply that interaction is absent from distance education, but it does limit that interaction to the influence of an educational organisation on the development and the provision of teaching materials, and the provision of technology-mediated communication between teacher and learner.

2.3 Distance education and interaction

The perception of distance education as providing limited opportunities for interaction was linked to the development of an industrial model of education (Peters, 1994); the production of distance education programmes that could be delivered cost effectively to large numbers of students separated in time and space. Perceived negative effects of lack of interaction were countered by some distance educators applying behaviourist techniques (Thorpe, 1995). The behaviourist educational model is teacher controlled and emphasises the systematic design of instruction in which complex concepts are split into more easily comprehensible parts and reinforcement is contingent upon the accomplishment of each step (Skinner, 1968). It makes a positivist assumption of a common reality from which learning objectives can be extracted and it emphasises the creation and testing of these objectives, so that the learning acquired is made manifest and can be demonstrated by students (Garrison & Anderson, 2003). Social interaction is not central to this pedagogy, although the printed materials may be designed to reproduce a conversational approach between instructor and student.

Despite the widespread use of this pedagogical model of distance education during the 20th century, its dominance was gradually eroded. Moore (1973, 1993) criticised this model, drawing on a humanistic tradition that emphasises interpersonal dialogue, when he argued that the ability of students to share responsibility for their own learning process was neglected by a focus on teacher-led instruction. He showed that separating teachers and learners in space and time creates a space of potential misunderstanding, which he termed the transactional distance. In his discussion of the relationship between transactional distance and learner autonomy, he called attention to more situated forms of pedagogy that take into account the interactions and emotions of the learner.

The establishment of The Open University in the UK in 1969 marked the start of a second generation of distance education, 'multi-media distance teaching' (Nipper, 1989, p63). For the first time, an integrated multimedia approach was used to support interaction. One-way communication from university to students took place via print, broadcasting and, later, cassettes. This was complemented by two-way communication between tutors and students involving face-to-face tutorials, short residential periods and correspondence tutoring (Hawkridge, 1996).

Cognitive constructivist pedagogy, based on Piaget's (1959) detailed studies of children's learning and development had focused attention on individuals' understanding and on their active construction of knowledge. There was a move away from a transmission model of learning, in which knowledge is thought to be passed from person to person, towards a participation model in which it is actively constructed (Sfard, 1998). Second-generation distance educators thus made increasing use of devices such as role models, simulated peers and summary reflections. The student experience of distance education became richer, but interaction between students and between students and teachers was still mainly restricted to telephone and mail.

A third generation of distance education in the late 20th (Nipper, 1989) and early 21st centuries has taken increasing advantage of the possibilities for interaction provided by communication technologies such as the Internet (Garrison & Anderson, 2003). These technological developments have not automatically led to changes in the pedagogies of distance educators. Like earlier technologies, the Internet can be used as a cost-effective delivery mechanism or as a communication medium employed to support individuals who are learning in relative isolation (Jones, Cook, Jones, & De Laat, 2007). However, for the first time, sustained two-way interaction between distance learners and between learners and teachers is possible. Courses can include greater interactivity between students, between tutors and students, and between students and course material (Hawkridge, 1996).

These new possibilities have been linked with increasing interest in social constructivist pedagogy, which takes from Vygotsky a focus on the social, on interaction and on using psychological tools to build knowledge together in groups.

2.4 Sociocultural perspective on learning

Social constructivist pedagogy is closely related to the development of a sociocultural perspective on learning, which also builds on the work of Vygotsky. The sociocultural view is that human societies and their members are mutually constitutive. 'The human actor operates in a cultural, social, material and technological setting, which poses problems but also offers tools and resources to create solutions' (Gipps, 2002, p73) The thoughts and actions of individuals maintain, alter and shape their setting. At the same time, the setting plays an important part in shaping the development of individual minds. It is through participation in joint activities that individuals come to understand cultural values and beliefs that have been constructed and refined by previous generations, and it is through collaborating to solve new problems that effective new skills and understandings are developed which can be passed into the wider culture (Wells & Claxton, 2002a). Sociocultural theory therefore proposes that learning cannot be understood without reference to its situated nature. It thus takes into account the immediate context of learners, but goes beyond this to situate learning 'in the trajectories of participation in which it takes on meaning' (Lave & Wenger, 1991), relating human mental processes to 'their cultural, historical, and institutional settings' (Wertsch, 1991, p6).

Also important for sociocultural analysis is the key role of the tools used by humans to extend and mediate their actions. As groups engage in joint activities, their success is related to their individual knowledge and skills, their environment, their ability to work together and the tools that they are able to use. These tools are not limited to physical artefacts, but include the meaning-making tools described by Vygotsky.

> It is particularly by learning to use these semiotic tools in discourse with others that humans appropriate the culture's dominant ways of thinking, reasoning and valuing. And in making them their own and in bringing them to bear on new problems and new situations, they may transform them in ways that add to and potentially improve the culture's shared toolkit of meaning-making resources (Wells & Claxton, 2002a, p4)

An extension of this view is that human culture is made up of artefacts, of which tools form a subset, and that an artefact 'is an aspect of the material world that has been modified over the history of its incorporation into goal-directed human action'(Cole, 1996, p117) Because artefacts combine the properties of tools and of symbols, they can form a useful unit of analysis for researchers. However, in this thesis, the term 'tool' is preferred, because of the strong linkage between artefacts and the 'material world'. The distinction between online and offline, virtual and physical, is elusive and so reference to online dialogue as material artefact is judged to be unnecessarily confusing.

The importance of tools means that sociocultural research is concerned with how groups of people learn together using tools in different settings, rather than with the experience and cognitive development of individual learners. In order to study the situated nature of learning, it considers three related levels of human activity: the cultural/historical, the psychological and the social. Cultural/historical considerations include the ways in which educational goals, dialogue and pedagogy are shaped by different cultures at different times. Study of the psychological level reveals how activity at cultural and social levels affects the cognitive development and learning of individual group members. The social level involves dialogue and the various forms of talk which enable learners to discover how people around them make sense of experience (Mercer & Littleton, 2007). The focus is at the same time on learners, their tools and their context. This distributed focus means that the sociocultural perspective is particularly suited to a contextualised study of learning together online and of the educational dialogue that this necessarily involves.

This perspective also focuses attention on group processes of knowledge construction and on how groups work together to build shared contexts, shared history and shared purpose. In order for groups of learners to work together successfully, they need to develop shared understanding of what they are trying to achieve, and shared knowledge on which they can build. Such shared, or common, knowledge is built through discourse and joint action and forms the contextual basis for further discussion (Edwards & Mercer, 1989) The negotiation of this knowledge and understanding is crucial to collaboration (Littleton & Häkkinen, 1999), and requires a continued attempt by those involved to construct and maintain a shared conception of the problems they are solving (Lipponen, 2002) and to coordinate shared meaning (Crook, 1999).

Groups develop shared understanding on the basis of a continuity of experience and discourse (Edwards & Mercer, 1989). This continuity allows them to develop a common context; a growing repertoire of knowledge and comprehension that enables individual group members to make sense of their shared activity and talk. Their context involves

> everything that participants in a conversation know and understand, over and above that which is explicit in what they say, that contributes to how they make sense of what is said (Edwards & Mercer, 1989, p63).

Context has an important temporal element; humans can reach back into their cultural past, project that past into the future, and then carry that future back into the present in the form of beliefs that constrain and organise their activities (Cole & Engeström, 1997). The temporal elements of context mean that shared history is an important resource; learners can make reference back to past discussion, actions or events (Mercer, 2000) and can draw on this shared history to shape their future. They thus have a shared understanding of what they are currently doing and of their future intentions.

Past experience contributes to this shared understanding and helps individuals to understand how they should act in a certain situation, and how those around them can be

expected to behave. Children discover early in life what many of the rules of classroom interaction and behaviour are. 'By the time children leave the Infant for the Junior school, the organisation of curriculum and routines proceeds on the assumption that they know how to be pupils, and understand what to expect and what is expected of them' (Willes, 1981, pp51-52). This understanding of implicit rules is likely to be limited and sometimes misleading (Edwards & Mercer, 1989) but, nevertheless, a lifetime of experience shapes learners' understandings of what is and is not appropriate in an educational setting, and of how learners and teachers talk and behave.

Learners therefore come to an educational setting knowing that it is conventional, when a student speaks, for the teacher to answer, confirm, approve and reinforce (Henri, 1995). They expect that teachers, along with certain other people, objects and representations, will have authority within the classroom and that this will endow them with the power to affect thought, opinion and behaviour (Hubscher-Younger & Narayanan, 2003).

In order to build shared knowledge, groups of learners need to develop a shared context in which they 'understand the conditions for collaboration and rules for coordinating the collaborative effort at the same time as solving the learning tasks' (Häkkinen, 2004). Shared context, also described as common ground, is constructed and maintained between individuals by a process of grounding (Baker, Hansen, Joiner, & Traum, 1999). This process does not only involve reference to a group's activities, it also involves monitoring the state of other group members, providing feedback and making repairs when individual understandings appear to diverge.

When working together as a group, individuals coordinate both the content and process of what they are doing. In order to do this, they employ dialogue to monitor and update the common ground that allows each to interpret the actions of other group members (Clark & Brennan, 1991). Common ground must be augmented and maintained during interaction, in

order to take into account new aspects of the common task or situation (Baker, et al., 1999). Different media bring different resources to, and also impose constraints on, grounding. Relevant factors include copresence (the ability to see the same things), cotemporality (the ability to access messages as soon as they are sent), simultaneity (whether participants can communicate at the same time or must take turns) and sequentiality (the possibility of turns being accessed out of sequence) (Baker, et al., 1999).

Humans continually use language for thinking together, for collectively making sense of experience and for solving problems (Mercer, 2000). Becoming an educated person involves learning special ways of using language; language is a teacher's main pedagogic tool (Mercer & Littleton, 2007). In an educational context, an important form of language is dialogue: a sustained discussion, carried out through speech or online, in which language is used to convey meaning. Participants in an effective dialogue are both contributors and active listeners (Moore, 1993). Through dialogue, they share knowledge and jointly construct understandings of shared experience that support learning (Crook, 1994).

Some forms of dialogue have been identified as important to education; some are explicitly taught and their use encouraged. These forms of dialogue have typically been identified in face-to-face settings and, more recently, they have been used to support understanding of online educational dialogue. Section 2.5 examines three of these forms – dialectic, dialogic and the IRF sequence – and research into their transfer from a face-to-face to a computer-mediated setting is discussed in Section 2.6. From Section 2.7, discussion moves to areas highlighted by that research, particularly to ways of characterising a computer-mediated setting, the relevance of broader studies of dialogue and questions that remain unanswered. In the light of this discussion, Sections 2.19 and 2.20 return to the subject of educational dialogue and discuss the forms on which this research focuses: the social modes of thinking identified by Mercer and his colleagues (Mercer, 2000, 2002; Mercer & Littleton,

2007; Mercer & Wegerif, 1999) and the progressive dialogue that Wells associates with the use of improvable objects (Wells, 1999).

2.5 Educational dialogue

One of the earliest recorded forms of educational dialogue is the dialectic employed by Socrates (470-399 BCE) and therefore described as 'the Socratic method'. This was originally an open-ended dialogue, which was gradually formalised, eventually being codified by Hegel (1770-1831) as a form of logic that proceeds from thesis to antithesis and thence, eventually, to synthesis. In educational settings, dialectic is employed when people need to combine their knowledge by sharing, comparing and combining contrasting views in order to come to a decision acceptable to the group, as would be the case in a court of law (Ravenscroft, et al., 2007). It is an effective form of educational argument that has been reconsidered and reworked many times (Hample, 1992; Popper, 1963; van Eemeren & Grootendorst, 1984) always retaining a focus on the structured use of language to reach a conclusion or a specific goal.

A more open-ended form of educational discourse is dialogic (Ravenscroft, et al., 2007; Wegerif, 2008a). This has its origins in the works of Bakhtin (1895-1975), who proposed that dialogic forms of literature, such as the novel, do not have fixed meanings, but are involved in continual dialogue with other literary works and authors. Each novel informs, and is continually informed by, other works (Bakhtin, 1981). Bakhtin (1986) did not limit the use of dialogic to literature but described how it applies to all use of language, arguing that any statement is both a response to things said previously and an anticipation of forthcoming responses.

In terms of educational dialogue, dialogic brings together different voices and views in order that they can cast light on each other, as in a brainstorming session, without the assumption that it is necessary or desirable to come to one conclusion. Being required to

represent understanding of a subject in a way that it is clear and convincing for others, and to reply to responses in a spirit of collaboration as well as competition, has been shown to be a particularly powerful method of knowledge building (Wells & Claxton, 2002a). In schools, dialogic has been used to emphasise collaborative group work and the uptake of children's ideas, to encourage pupils to recreate accounts in their own words and to emphasise a collective, reciprocal and cumulative approach to learning (Skidmore, 2006).

In a classroom setting, other structured forms of educational dialogue are put to use, although they are rarely explicitly taught. Discourse analysis has shown that spoken interchanges between teachers and students typically have a three-part structure in which teacher input frames student responses (Sinclair and Coulthard, 1975). In such initiation, response and follow-up (IRF) exchanges, the teacher initiates an exchange through questioning, students respond to the questions and there is then follow-up by the teacher. Questions in IRF exchanges tend to be rhetorical devices designed to gauge student understanding rather than genuine requests for information. Students must therefore learn to interpret the IRF exchange in the context of its cultural setting, recognising at some level that a teacher who asks to be told the product of two and two is unlikely to be ignorant of the expected answer, but is using the exchange as a tool to maintain control of the classroom agenda and to elicit information about individual progress.

The IRF sequence forms a strong basis for the discussion of classroom dialogue, but it is closely associated with situations in which an instructor takes the lead, rather than with group discussion. Any change to the established order of this form is linked to changes in the power relationships between participants (Wertsch, 2003). Different dialogue structures indicate variations in pedagogy. While simple IRF exchanges suggest a transmission style of teaching, more extended sequences of IRF exchanges may be used to take up and build upon students' contributions. These 'spiral IRF sequences' (Wegerif, Mercer, & Rojas-Drummond, 1999) help to draw students into the process of constructing knowledge. A

more detailed sequence, Initiation – Dialogue – Response – Feedback (IDRF) (Wegerif & Mercer, 1996) does not focus on the teacher's input but incorporates dialogue between students, allowing learners a more active role and supporting them in working together.

These IRF and IDRF patterns of classroom dialogue are primarily teacher led, rather than being tools used by groups of learners. They are significant here because they are language tools used to support education that have been studied in both face-to-face and computer-mediated settings. Investigations of these changes of context from a sociocultural perspective have contributed to a growing awareness that effective use of language tools depends on cultural and the social setting and can be supported by structured intervention. Section 2.6 deals with research showing the transfer of language tools from offline to computer-mediated settings is often problematic and may alter both the tools and the ways in which they are used.

2.6 Educational dialogue in different settings

Studies of the IRF sequence in computer-mediated environments have revealed significant disruptions to the expected sequence of contributions. Giordan (2003) found that tutoring through the medium of email changed the structure of the IRF exchanges by encouraging students, rather than tutors, to initiate the interaction. The findings of this small-scale survey were supported by Schrire's (2006) case studies of knowledge building in asynchronous discussion groups. These identified synergistic threads of discussion in which students collaborated with each other, initiating and following up discussion points themselves rather than relying on an instructor to take the lead. A less positive change to the IRF sequence was identified by Berge and Fjuk (2006), whose analyses of synchronous online meetings identified disruption to the timing of the sequence. In co-located settings, follow-up comments would typically be made immediately after responses, but this was

not automatically the case in the online setting, where a delayed follow-up could at first make it appear that students' responses were being ignored.

These studies used pre-existing educational dialogue as data when examining the transfer of specific language tools from a face-to-face to a computer-mediated setting. Ravenscroft and his colleagues (Ravenscroft, 2007; Ravenscroft & McAlister, 2006; Ravenscroft, et al., 2007) took a different approach and documented work to develop dialectic and dialogic approaches for use in online educational settings. This involved the creation of 'dialogue games' to support conceptual change and development.

A dialogue game sets out the goal and rules of an interaction, the roles of the participants and the moves that may be performed. Varying these elements has the potential to promote either a dialogic or a dialectic approach. For example, the CoLLeGE (Computer-based Laboratory for Language Games in Education) dialogue modelling tool encourages dialectic by including the possible moves assertion, question, probe and resolve; making it clear that resolution is required (Ravenscroft, et al., 2007). Other pieces of related software, 'AcademicTalk' and 'Interloc', scaffold a more open-ended, dialogic approach by offering generic sentence openers such as 'Can you elaborate...' 'Is there evidence…' and 'I disagree because…' (Ravenscroft, 2007; Ravenscroft & McAlister, 2006).

Ravenscroft identified ways in which these dialogue games differ from students' experience of dialectic and dialogic in a face-to-face environment in terms of affective issues. Tutors who were interviewed about use of such a tool felt that it benefited the students who would tend to agree unconditionally with peers in a face-to-face setting. The tutors' view was that the tool helped students to participate in collaborative and critical argumentation, rather than being too embarrassed to criticise others or to state their opinions directly. Other studies drew attention to students overcoming emotional barriers such as shyness, discomfort or a lack of confidence (Ravenscroft, 2007).

These studies show that there are clear differences between the uses of language tools in speech and in computer-mediated communication. They also suggest that 'computer-mediated communication' is too broad a description to support nuanced analysis of the use of language tools in situations as different as a structured synchronous discussion and an asynchronous online meeting. Section 2.7 therefore considers the use and development of this term and its alternatives.

2.7 Computer-mediated communication

The use of 'computer-mediated communication' (CMC) as an overarching descriptor obscures the differences between the tools available to online learners and the facilities that these tools offer to students and tutors. 'Computer-mediated communication' draws attention to one tool, the computer, diverting attention from the different communication tools that are resourced by computers. Just as print media resource learning, but it is important to be able to distinguish between a poem and a textbook, so CMC resources learning but it remains important to distinguish between different types of communication.

Twenty years ago it was useful to unite different media, such as electronic mail, online databases and computer conferencing, under the heading CMC in order to understand their potential uses for education. Kaye described these means of communication as one medium that provided 'non-synchronous, text-based group communication' (Kaye, 1989, p6). Linking these forms of communication under one heading made it possible for researchers to amalgamate their understandings of learning mediated by a variety of tools (Mason & Kaye, 1989).

Today, the commonalities identified by Kaye do not exist. These forms of communication may be synchronous or non-synchronous, or they may offer both possibilities; they may be text-based, audio-based or graphics-based; they may be used for group communication, for two-way discussion or for personal reflection. They may still be mediated by computers,

but are increasingly likely to be mediated by personal digital assistants (PDAs), mobile phones, MP3 players, games consoles or a host of new technologies. Computer-mediated communication has thus been transformed into online dialogue. However, a term which encompasses two children sitting next to each other and communicating synchronously by drawing and transferring pictures on handheld games consoles such as the Nintendo DS, a video conference involving international participants, and a long-running asynchronous collaboration in a computer forum is too broad to help with an identification of the affordances of tools for learning in an online environment.

The term CMC is therefore of limited use because the gaps between its different forms are growing wider. Nevertheless, alternative terms can prove to be misleading. Until recently, it was rarely necessary to distinguish between physical and virtual settings and so the dictionary definitions of many English words take a physical setting for granted. The words 'talk' and 'dialogue', with their assumptions of synchronicity and co-presence, both make an uneasy transition to an online setting.

People communicating online often refer to their written messages as forms of talk, but there are major differences between oral and written modes of expression (Ong, 1982). These distinctions, discussed in more detail below, are important for the study of learning because of the dynamic relation between speech and thought (Vygotsky, 1987b). Writers need to spend time reflecting on their thoughts in order to convey meaning effectively (Vygotsky, 1987b). Therefore, although in certain cases online communication can be referred to as 'talk' or as 'text', these terms are not necessarily appropriate in the context of learning, because they take for granted assumptions about the synchronous nature of talk, the asynchronous nature of text and the available physical cues. These assumptions are associated with understandings of the relationships between speech, text and thought.

An alternative is to describe online communication as ‘discourse’. This has the advantage of being a term used to describe both speech and text or, more broadly, ‘language in all its modes’ (Wells & Claxton, 2002a). However, it also has much wider meanings and, in an academic setting, is equally likely to refer to a ‘system of representation’ (Hall, 2001, p72) or to a connected series of ideas and meanings, for example, a ‘geographical discourse’ (Foucault, 2007) or a ‘pedagogic discourse’ (Hasan, 2002).

From a sociocultural perspective, ‘usage of a specialist discourse and membership of a specialist discourse community’ are key goals for a student (Northedge, 2002, p252). Online communications between learners thus form part of broader discourses within professional and subject areas as well as within their educational setting. To style this form of communication as discourse potentially confuses individual sets of communications with more culturally pervasive discourses.

Many authors have therefore chosen to describe online communication, particularly online communication related to learning, as ‘dialogue’ (Bonk, Hansen, Grabner-Hagen, Lazon, & Mirabelli, 1998; McAlister, Ravenscroft, & Scanlon, 2004; Ravenscroft, 2007; Ravenscroft & McAlister, 2006). ‘Dialogue’ was originally a broad term, referring to ‘a conversation carried on between two or more persons; a colloquy, talk together’ (Michaels, O'Connor, & Resnick, 2008). This understanding of dialogue, which dates back to the 13th century, retains connotations of co-presence and synchronicity. Mercer and Littleton note that dialogue ‘is sometimes used in a broad sense to mean the interchange of ideas between one source and another’ but, for the purposes of their classroom-based research, they define it as ‘classroom talk’ (Mercer & Littleton, 2007, p1). Even in distance education, listening may be assumed to be an element of dialogue: ‘each party in a dialogue is a respectful and active listener; each is a contributor and builds on the contributions of the other party or parties’ (Moore, 1993, p21).

This thesis takes dialogue to mean both talk and its online versions – an interaction between individuals in which language is used by two or more participants to convey meaning. The expectation is that, in a learning environment, the ideal is a positive, productive interaction that 'is purposeful, constructive and valued by each party' (Moore, 1993, p21) but, as with talk, this is not always the case and not all educational dialogue will achieve any or all of these positive elements (Howe & Mercer, 2007).

Nevertheless, effective educational dialogue is associated with productive interaction. Whether an interaction is productive can be judged in a variety of ways. Conventionally, interaction is considered productive if students exhibit pre- to post-test gain on a measure of knowledge or skill. Issroff (1999) studied learner interactions around computers over time and found that productive interactions could also be considered to be ones in which hardware did not dominate, or in which students discussed their task. Howe and Tolmie's (1999) view was that productive interaction involves students discussing their individual understandings. In this thesis, productive interaction within a group is taken to be interaction that helps the group to extend its understanding and to achieve its goals (Light & Littleton, 1999). Although a group's goals in an educational setting are likely to be task-related, there is no requirement for productive interaction to be task-focused.

Unproductive interaction, in contrast to its productive form, has a negative effect in that it makes a group less likely to achieve its goals. These definitions stem from the view that knowledge is co-constructed, and they therefore focus attention on groups of learners, rather than on individual learners or teachers.

Online dialogue may be an element of productive or of unproductive interaction. It can also be classified as synchronous or as asynchronous. The distinction between these two forms is not necessarily clear-cut. For example, groups may hold synchronous conversations in asynchronous forums. North (2007) documented exchanges on an online

discussion board which were largely synchronous because the conversation tended to proceed steadily with gaps of only a few seconds between postings, but synchronicity was lost when postings were separated by several minutes.

Even in synchronous environments, points may be prepared in advance and presented at appropriate points in the discussion. The confusion is greater in a virtual world, where a form of delay known as lag can distort the chronology of synchronous discussion, leading in some cases to responses being displayed before questions. However, in the majority of cases, synchronous media such as chat rooms, instant messaging and virtual worlds are structured on the basis that participants are co-present in time, while the assumption with asynchronous media such as email and computer conferences is that participants in the dialogue will be participating at different times.

Synchronous dialogue is therefore defined here as communication mediated by technology during which it is assumed that participants will be present at the same time for all, or for the majority, of the interaction. It is the assumption of temporal co-presence within the dialogue that distinguishes asynchronous from synchronous communication, rather than the intervals between conversational turns. However, synchronous communication typically involves very little time delay between statement and response, so discussion proceeds quickly and the language looks much less prepared and monitored than most conventional forms of writing (Mercer, 2000). In educational settings, synchronous communication is useful for specific subject areas such as language learning and, more broadly, for discussions about task assignment or group formation, for brainstorming and initial exploratory discussions, for dealing with administrative issues rapidly, for prepared question-and-answer sessions and for facilitating group processes (Lapadat, 2002).

As stated in the Introduction, in this thesis asynchronous dialogue is taken to mean sustained discussion involving two or more people whose contributions are not expected to

be in temporal proximity. It is an important tool that teachers and learners employ in a variety of ways: to build social relationships, to mediate collaboration, to construct online learning environments, to supplement face-to-face interaction and to support distance learners who are working individually. When it is used to support social constructivist pedagogy, it provides opportunities for learners to interact and build knowledge together when they would not otherwise have been able to do so. Individuals who have never met in person can collaborate on group work that is mediated by asynchronous discussion.

2.8 Asynchronous dialogue: distinct from writing and speech

Online dialogue has been described as a new form of communication, neither writing nor speech (Garrison & Anderson, 2003; Yates, 1993). However, the available metaphors commonly identify it with one or other of these forms. Users of computer-mediated communication often refer to their written messages as forms of talk (Baron, 2005), and may adopt an unedited writing style akin to the informality of much speech, which suggests they are treating their communications as ephemeral (Baron, 1998). However, as Garrison and Anderson (2003) discuss, a key characteristic of such dialogue is that it is text-based. As Ong (1982) demonstrated, there are major differences between oral modes of thought and expression and written modes, and Garrison and Anderson consider the differences between spoken and written communication key to understanding the effective use of asynchronous dialogue.

To understand why asynchronous dialogue should be considered as a new form of communication, rather than as a variant form of speech or writing, it is important to examine the ways in which speech and writing differ from each other, and the implications that these differences have for learning. This necessitates a return to the work of Vygotsky (1987b), who wrote extensively on the relationship between thought and language, arguing

that the distinction between spoken and written language is crucial because speech and thought are dynamically related (John-Steiner, 2007).

Thought does not consist of individual words and therefore does not immediately coincide with verbal expression. ‘What is contained simultaneously in thought unfolds sequentially in speech’ (Vygotsky, 1987b, p281). To understand this more clearly, it is useful to examine different types of speech and how they are related to thought. The work of the developmental psychologist Jean Piaget has been influential in this area. Piaget (1959) described egocentric speech, used by young children to relate to themselves in an undertone what they are doing. Vygotsky described a related phenomenon: inner speech, a silent inner thought which is connected with words, ‘a dynamic, shifting, unstable thing, fluttering between word and thought’ (Vygotsky, 1987b, p149). He placed emphasis on the importance of inner speech to thought, believing that it plays a vital role in planning and problem solving and that it can be used as a tool for self teaching, correcting errors, clarifying thought, supporting memory, creating, organising and experimenting.

Inner speech is qualitatively different from external speech, which is speech directed at and designed for others, a materialising of thought in the form of language (Vygotsky, 1997e). The act of speaking involves employing a sign system which forces the speaker to say both more and less than is understood or intended. Consequently, a listener may understand more of the message than the speaker. This feature of speech is put to use in educational settings, where students are encouraged to say and do things they only partially understand (Wertsch, 2007). Speech allows them to function at a stage ahead of their current knowledge, supporting their moves through successive levels of expertise.

Vygotsky distinguished between inner, oral and written speech. He considered that ‘written speech is the polar opposite of oral speech’ (Vygotsky, 1987b, p272), because it excludes the potential for abbreviation through intonation, mimic, gesture or reference to the

situation. This is only partially true; writers are not totally reliant on their words to convey meaning. However, the general point remains, that understanding is enabled through the combination of words. To do this, with or without drafts and redrafts, forces writers to reflect on their thoughts. Written speech therefore facilitates speech as a complex activity (Vygotsky, 1987b). However, written speech is not simply a physical representation of external, or oral, speech because 'it stands closer to inner speech than external speech; it is associated with meanings and passes by external speech' (Vygotsky, 1997e, p135).

Ong (1982) showed that the addition of writing to the set of human language tools produced major qualitative changes in what could be thought and in how it could be thought. For example, 'abstractly sequential, classificatory, explanatory examination of phenomena or of stated truths is impossible without reading and writing' (Ong, 1982, p9). Asynchronous dialogue, being a new language tool, has the potential to produce equally far-reaching changes. It is a complex blend of inner, oral and written speech, and Mercer's view (2000) is that its combination of characteristics of speech and writing makes it a welcome and valuable addition to the toolbox of language. Although it has some characteristics of both talk and writing, its chronology and its use of layout and typography mean that it has emergent properties that belong to neither. These emergent properties are not the same as those of synchronous online dialogue, which is characterised by immediacy and fast responses (O'Connor & Madge, 2001).

2.9 Coherent dialogue

Another significant feature of asynchronous dialogue is that it is structured and patterned in ways that differ from both text and talk, significantly disrupting the conventions of everyday speech. For learners to use this form of dialogue to support the co-construction of knowledge, they must be able to construct a coherent dialogue, in which individual turns are attached to the dialogue context by means of a coherence relation (Hulstijn, 2000).

Coherence is a basic element of dialogue because it allows individuals to work together to establish meaning rather than exchanging a string of unrelated comments. It is difficult to produce mutual understanding or shared values and goals when communicating parties are continuously required to generalise and integrate pieces of knowledge from multiple perspectives in order to construct a common ground. Without coherence there is no exchange of meaning, so any dialogue, from a reasoned debate to a string of insults, involves participants establishing coherence in order to communicate with each other.

Coherent dialogue involves conversational partners developing a shared understanding of what they are talking about and of how elements of the discussion relate to each other, distinguishing between the contributions of different people and between different elements of the conversation and building confidently on past conversational turns. However, achieving coherence in asynchronous dialogue is not straightforward because methods used to do this in spoken dialogue, such as linking by sense or by grammar (Carlson, 1983), often cannot be applied or require adaptation (Herring, 1999).

In order to engage in coherent dialogue in an online setting, learners need to be aware of how asynchronous discussion generally proceeds, and how it can be expected to proceed in specific situations. Herring (2003) has shown that online communicators relate their understanding of these issues to their experience of constructing coherent dialogue through speech and writing, and to their experience of familiar forms of coherent educational dialogue such as classroom talk.

Examination of how speech is ordered in everyday life and, more specifically, in the face-to-face classroom, highlights the discursive structures and devices that are used to establish coherence in speech and in printed text. Detailed studies of talk by discourse analysts have shown that people share common understandings and rules of spoken conversation. Cohesive ties, three-part lists, adjacency pairs, back channels and hedging are among the

discursive devices used to structure and pattern talk. Sections 2.9.1 to 2.9.4 deal with common structuring features of everyday speech, considering those which need to be adapted or replaced if learners and tutors are to link conversational turns within asynchronous discussion and thus engage in coherent dialogue.

2.9.1 Structuring dialogue: transitions and acknowledgments

Sacks, Schegloff and Jefferson demonstrated that, in everyday exchanges, there is a normative ideal of 'no gap, no overlap' (1974, p700) – a situation in which conversational turns follow one another with no breaks and no speaker talking over or across another. They identified various devices for arranging turn allocation, and different ways in which speakers organise the structure and timing of responses. One device is the adjacency pair, a conversational turn that requires a particular type of response to be made as soon as possible. A question demands an answer, while a greeting requires an acknowledgement.

Another device that enables precise transition from one speaker to another is the three-part list – listeners recognise that a list will be completed once its third element has been supplied (Jefferson, 1990). Listeners may also signal their continued attendance and their reaction to what is being said by the use of back-channel responses such as gestures, nods or sounds such as 'uh-huh' which act as acknowledgement tokens without their producers taking the conversational floor (Drummond & Hopper, 1993).

2.9.2 Structuring dialogue: cohesive ties

A set of language techniques known as 'cohesive ties' are used to build coherence in both speech and writing (Halliday & Hasan, 1976). These grammatical links between phrases and sentences serve to connect stretches of language by building relationships between the smaller units. Cohesive ties include the use of conjunctions to link ideas, pronouns to refer back to nouns, punctuation to signal the start or end of ideas and repetition to recall past

input. Anaphoric references, links back to an earlier phrase, are commonly used. For example, in the sentence ‘Are we using observational behavioural data, spoken data or both for our research?’ the word ‘both’ is an anaphoric tie that links back to ‘observational behavioural data’ and ‘spoken data’.

Cataphoric references, references forward, are also important. In the group of sentences ‘Questions I would like to ask are: 1. Are we coding the data to use with statistical analysis? 2. Are we going to make any reference to the question of ethical issues?’ the first six words form a cataphoric reference to the forthcoming text. In the context of education, cohesive ties have been used analytically to pursue the emergence of ideas and to show how speakers and listeners create meaning together (Mercer, 2000).

2.9.3 Structuring dialogue: delicate objects and hedging

Speech typically develops coherently and meaningfully through the use of discursive devices such as these. Its development is limited by ‘ritual constraints’ used to ensure that interaction does not convey something unintended or untoward (Goffman, 1981). These constraints make some subjects difficult to discuss, and such topics may be considered ‘delicate objects’ (Silverman, 2001; Silverman & Perakyla, 1990). When delicate objects are under discussion, participants are likely to hedge their contribution in some way. Hedging is a form of metadiscourse, in that it helps participants to interpret and react to the content of a statement (Lakoff, 1973; Vande Kopple, 1985). It allows those expressing an opinion to modify their propositions later and to express not only the extent to which they commit themselves to certain propositions (Lakoff, 1973) but also both tentativeness and possibility (Hyland, 1966; Skelton, 1988a).

Forms of hedging include the use of impersonal phrases, modal verbs, sentence openers such as ‘I believe’ and the addition of ‘-ish’ to adjectives (Skelton, 1988b). When delicate objects are under discussion, speakers may use ‘prospective display sequences’ – attempts

to elicit the opinion of someone else before stating their own point of view (Maynard, 1991) – or they may shift their 'footing', their alignment to those present, for example by moving from the first person to the third person, or from the active to the passive voice (Goffman, 1981).

2.9.4 Structuring dialogue: building on the past

The devices described above are used to build coherent dialogue in the short term, over periods of seconds or minutes. Educational dialogue requires the development of ideas over more extended periods and thus employs discursive devices that allow classroom dialogue to develop coherently between lessons and over longer periods of time. Teachers in a variety of face-to-face settings use the same devices to link different units of dialogue, helping learners to rework, reshape and restructure the evanescent sounds of speech into shared knowledge on which they can build together. Mercer and Littleton (Mercer, 1995, 2000; Mercer & Littleton, 2007) highlighted five techniques used in the classroom to build the future on the foundations of the past by eliciting knowledge from learners, responding to what learners say and describing significant aspects of shared experience:

- Literal recap: Recounting past events.
- Reconstructive recap: Aligning accounts of the past with current pedagogic concerns.
- Elicitation: Prompting the recall of relevant information.
- Repetition: Repeating responses in an evaluative fashion
- Reformulation: Presenting responses in a clearer form.
- Exhortation: Asking others to recall relevant past experiences.

Because it is typically teachers who take the lead in doing this in the classroom, the use of these discursive devices is strongly associated with teachers rather than with learners. If online groups of learners are to develop their ideas over time and develop a shared

interpretation of what they have achieved together, they therefore face the challenge of adapting or replacing tools that were developed for use in a very different setting.

These discursive devices, together with those described in Sections 2.9.2 to 2.9.4, are employed to establish meaning and build knowledge through dialogue in face-to-face educational settings. They therefore suggest a starting point for an investigation of how this is achieved by groups of learners employing asynchronous dialogue. First, it is important to identify some of the challenges that an asynchronous environment presents to groups attempting to develop shared understanding over time.

2.10 Developing coherent dialogue online

In a face-to-face environment, developing coherent discussion through the use of linguistic tools and different forms of dialogue can appear straightforward. However, these skills are not easily acquired. From an early age, humans learn to carry ideas forward through speech (Vygotsky, 1987a), to establish the context of conversations, to check understanding and to understand and act on the cues offered by others. Despite this, although most people in the UK spend ten or more years learning to understand the dialogue patterns of formal education, studies show that teachers and learners frequently fail to establish an agreed context and shared knowledge (Edwards & Mercer, 1989; Mercer & Littleton, 2007; Sinclair & Coulthard, 1975).

Nevertheless, students on distance education courses commonly have little or no experience of online dialogue, and are expected to develop the equivalent skills for use in asynchronous dialogue within a short period of time, with relatively little training, and with access to only limited examples on which to model their behaviour. Learners therefore often need their tutors to act as ‘discourse guides’ (Littleton & Whitelock, 2004, p180) who can model appropriate ways of engaging with subject matter, setting and others on the

course. By the ways in which they post and frame contributions tutors subtly signal what it means to learn and to be a learner in an online environment (Littleton & Whitelock, 2004).

In an asynchronous setting, developing shared interpretations is difficult because the lack of immediate feedback or, on occasion, the lack of any apparent feedback make it difficult for learners to demonstrate that they have a shared understanding or to test whether they are beginning to achieve such an understanding. At the same time, lack of temporal continuity makes it difficult to use context as a basis for sense making. Related turns may be separated by many messages and extended periods of time or, conversely, people may post simultaneously, disordering the sequence of the exchange. One asynchronous posting may reply to two or three other postings or may deal with several different issues, which would be unusual in spoken conversation.

Even in a threaded discussion, in which related messages are linked by their headings and often displayed together, threads quickly become entangled and are disrupted by irrelevant messages. Work has to be done by both readers and writers to establish how contributions are linked to others. Ways have to be found to link asynchronous postings to form coherent dialogue, and to shape that coherent dialogue so that it supports collaboration. Learners therefore face several challenges to the creation of common knowledge over time through asynchronous dialogue.

Herring (2003) identified some of these challenges, showing how many arise from the differences between face-to-face conversation and asynchronous exchanges. In contrast to the situation of 'no gap, no overlap' that can be expected in everyday speech, online conversation includes substantial gaps lasting hours or even days. In addition, topics often overlap. Sometimes this is because people post at the same time, but often it is because one conversational thread continues while another starts or is temporarily set aside. The

normative conversational ideal of precisely alternating turns is therefore never achieved, and turn adjacency is disrupted.

In spoken dialogue, adjacent turns can be expected to relate to each other (Herring, 2003). In asynchronous dialogue this is not so and, in any case, discussion is chronologically fragmented because individuals may choose to view contributions by topic or author rather than by date or time. Even when the display is chronological, turns do not necessarily follow each other as conversational partners enter and leave the conference at different times and different discussions are woven together in a continuous list of postings.

Disconnected postings would be unlikely to support the exchange of meaning that is an important aspect of educational dialogue. Learners therefore need to establish links between postings clearly so discussion can develop. Herring showed that users of asynchronous dialogue signal answers and attention by interspersing responses within the messages of others (Herring, 1999). They create an illusion of adjacency by referring explicitly to earlier postings, by the use of direct quotes or by adding their messages to threads.

Lapadat (2007) identified several methods of achieving coherence in asynchronous conferences that would also be used in speech: posing and answering questions, referring to or acknowledging other input and contextualising contributions. Other methods she identified, particularly the use of message headers and direct quotation, have important visual elements and are therefore more closely connected with the textual environment.

2.11 Visual elements of asynchronous dialogue

‘Plain written words are not just language, they also carry meanings that are visually organized: by the choice of font, page layout, headers and footers, typography, paragraphing etc’ (Lemke, 2002, p42). Asynchronous dialogue also contains many visually

organised elements. These are the parts of messages that are accessed through visual literacy rather than an understanding of language. They include layout, type size, colour, font, icons, shading, punctuation, numbering, emoticons, spacing, use of bold and italic, hypertext links, capitalisation and other elements of typography and layout.

These visually organised elements play an organisational role within online dialogue. Their effective use can make discussion easier to manage, supporting authors' and readers' mental processes, adding to meaning and helping groups to build knowledge. Storkerson (1997) showed that hypertext links require readers to work out what is notable and for what purpose it might be used, and that the work of selecting, arranging and editing text is therefore shared between reader and author to a greater extent than it is in linear text. While considering the design of online communities, Preece (2000) drew attention to the ways in which visual elements can support or hinder users' ability to navigate a site; considering a variety of these elements in relation to the usability of websites.

These visually organised elements also play an affective role within online dialogue. The complexities involved in the use of identity cues such as message headers, signatures and stylistic differences were demonstrated by Donath (1999) in her consideration of identity and deception online. Choice of typeface affects how seriously messages are taken and provokes assumptions about the age, rank and gender of authors (Shaikh, Fox, & Chaparro, 2007). Waseleski (2006) showed how use of punctuation in online environments is subtly gendered; emoticons have been shown to influence responses to postings (Walther & D'Addario, 2001); and Garrison and Anderson (2003), Parks and Floyd (1996) all briefly refer to the ways in which greetings, encouragement and paralinguistic emphases such as capital letters, punctuation and emoticons are used to establish familiarity.

These studies were all limited in their scope; there has been little sustained interest in the visually organised elements of online dialogue from researchers. In particular, no one has

considered the relevance of these elements to online learners, how they can benefit from effective use of these elements or how tutors can support their use and development.

2.12 Time and asynchronous dialogue

These textual elements are important, but asynchronous dialogue is distinct from other forms of communication not only because of its textual nature but also because of its unique chronology. Studies of the affordances of asynchronous dialogue for group learning must, therefore, also take into account the dimension of time.

Early research into asynchronous communication did not consider the ways in which the dialogue changed and developed over time. These time-limited studies resulted in a frequently expressed view that this was a 'thin' medium, lacking many of the cues available in a face-to-face setting (Joinson, 2003). Parks and Floyd (1996) summarised barriers to communication which previous researchers had identified. Relational cues emanating from the physical context were considered to be missing, as were nonverbal cues about vocal qualities, bodily movement, facial expression and physical appearance. As a result, Parks and Floyd (1996) found that people communicating asynchronously were expected to experience difficulty in moving towards shared points of view and to be more likely to engage in verbal aggression, blunt disclosure and nonconforming behaviour than in a face-to-face environment.

These disadvantages of online communication were identified before the Internet was widely used (Sproull & Kiesler, 1986) and they have since been shown to bear a strong relationship to time. Walther and Burgoon showed that these narrowly focused studies were misleading and that 'although initial differences in relational communication between CMC and FTF [face to face] may exist, they tend to be eliminated over time' (Walther & Burgoon, 1992, p81). Walther went on to argue (1996) that the key differences between computer-mediated communication and face-to-face communication are not related to the

amount of social information exchanged, but to the rate of exchange. This led him to reject the notion that computer-mediated communication is inherently impersonal and to focus on the factors that interacted with this form of communication to foster impersonality.

Walther and Burgoon's findings were supported by Hara, Bonk and Angeli (2000), who showed that interaction patterns in online environments change over time.

Over time there are changes in interaction patterns, development of social relations, talk and transmission of social information (Hara, et al., 2000; Jones & Issroff, 2005; Kreijns, Kirschner, & Jochems, 2003; Parks & Floyd, 1996; Sproull & Kiesler, 1986; Walther, 1996). Walther and Tidwell (1995) stressed the importance of chronemics, a nonverbal code system involving variations in the use of time. These include normative standards regarding the time of day at which certain topics are discussed, and the delay in responding to messages. Chronemic cues help to define both the nature and the quality of online relationships. 'A sender's intimacy was judged through the complex pattern in which the content, time of day, the speed of someone's reply to that message all took part' (Walther & Tidwell, 1995, p371).

As learning is a temporally situated process, learners are affected by their experience of interaction with fellow learners, by their expectations of what is to come and by their previous experience. There are also important, time-related, contextual factors that include existing and established relationships which influence the dialogue (Rasmussen, 2005): similar past experiences and shared history (Mercer, 2008), the possible extension of the dialogue beyond a set educational task (Haythornthwaite, Kazmer, Robins, & Shoemaker, 2000) and the expectation of future interaction (Walther, 1994).

These changes over time are important for the study of learning from a sociocultural perspective. This approach, sometimes described as 'socio-historical or 'cultural historical' (Daniels, 2001; Wells & Claxton, 2002b; Wertsch, 1991) has a particular interest in how

learning is situated in, and develops over, time. The time period varies, from the development of mental processes over millennia (Vygotsky, 1997b) to trajectories ranging from months to minutes (Kumpulainen, Vasama, & Kangassalo, 2003; Mercer, 2000; Rasmussen, 2005), but sociocultural researchers agree that communication, thinking and learning are related processes shaped by culture over time.

> Everything takes time to happen; every process or activity that goes through distinct changes, stage or phases, has its own history, no matter how brief… we have to pose the question of how these little histories of moments and hours come to add up to the longer history of a life or a community. (Lemke, 2002, p38)

To analyse and understand these temporal processes, it is necessary to clarify how time is understood. Different conceptualisations reveal a tension between descriptions that stress the irreversibility of actions, and those that draw attention to the persistent repetition of patterns. For Isaac Newton (1687/1848), time flowed on uniformly, unaffected by anything external. This linear conception, in which one event follows another, is strikingly different to the Pythagorean conception of time as a wheel that spins the years, the seasons and human life from birth to death (Huffman, 2008). These views indicate two broad metaphorical categories: time as flowing line and time as spinning circle.

Educational researchers have produced nuanced accounts of the temporal patterns of learning that combine and develop these basic forms. This thesis draws on Lemke's account of the different scales of time, and on Wells' description of the continuing spiral of knowledge development.

Lemke (2000, 2001, 2002) drew attention to the parallel timescales of education. Events that are momentarily significant may not be noticeable on the timescale of a lesson or a term but in some, rare, instances they will resonate through a year, a lifetime or an epoch. Time is therefore layered; it can be studied at different scales. Lemke was concerned with how these timescales intersect and interact, and with how information is exchanged

between them. He described semiotic artefacts: things with which humans interact in ways that depend on interpretations of meaning as well as on physical properties. These semiotic artefacts can persist over long time scales and can be used to transfer information from and to short-term events that are distant in time (Lemke, 2001).

Wells' (1999; 2002a) account of learning portrays it as a cycle of knowing, linear but curved, a progressive spiral rather than a repeating circle.

> Knowing starts with personal experience which, amplified by information, is transformed through knowledge building into understanding, where understanding is construed as knowing that is oriented to action of personal and social significance and to the continual enriching of the framework within which future experience will be interpreted. This experience, of course, then provides the starting point for a new cycle (Wells, 1999, p85)

Four elements – experience, information, knowledge building and understanding – are repeated again and again. When they combine to transform both the learner and the learner's social environment, the result is ongoing development. This requires individual participants' past experience to be combined with new information. Through dialogue, learners make sense of and evaluate new information, relating it to what they already know and believe, and using it to enhance their understanding and guide their actions (Wells, 1999; Wells & Claxton, 2002a).

The temporal nature of asynchronous dialogue means that the processes of knowledge building differ from those in a face-to-face environment. Conference postings have the potential to be used as semiotic artefacts that move ideas across the scales of time, from the momentary to the persistent. At the same time, they confuse the sequence of the collaborative development of knowledge because each participant experiences them over a different period of time. Because contributions to discussion may be ordered and viewed by author, by title or by size rather than by chronology, the order of turns in the dialogue is

not the same for every participant. Although asynchronous dialogue is closely related to speech, it differs from it in its temporal, as well as its textual, nature.

There is therefore a tension between the perceived similarities and the actual differences between online and offline learning dialogue. Asynchronous learning dialogue cannot be understood in isolation, because both learners and teachers draw on their experience of classroom interaction when they engage in it. Section 2.13 examines constraints experienced by learners when understandings of education developed in a face-to-face environment are employed online.

2.13 Constraints of educational dialogue

Sims (1997) identified a series of false assumptions about online learning that may be made by educators. These include the belief that traditional teacher-student interactions can be mapped directly to online interactive learning. The majority of educators take learners' social interaction for granted (Kreijns, et al., 2003); thinking that because it is easy to achieve or already present in face-to-face situations, the same will be the case online. Educators and learners may retain the views that social talk is 'digressing off-topic' (Weinberger & Fischer, 2006) and that organisational work, such as the division of labour and timetabling, is part of the role of teachers rather than a chance for learners to acquire a set of important skills (Garrison & Anderson, 2003).

McConnell (2006) investigated students' experiences of online group learning with a closed questionnaire distributed to students from a masters course in e-learning (N=50) and demonstrated that many of them lacked skills necessary for engaging productively in asynchronous dialogue. There was a mismatch between their perception of the advantages of online group learning and a widespread lack of the skills necessary to make effective use of those advantages by linking conversational turns into coherent dialogue.

The majority (93%) of these students felt that working together online had helped their learning, by providing opportunities for them to share information and ideas and have their ideas heard and discussed, as well as by providing time to prepare thoughtful contributions to discussions. Despite this, 23% of these students found it difficult to learn effectively in this way. A quarter had often found it too difficult to follow the thread of a discussion and 59% believed that the asynchronous nature of discussion often meant that, when they got round to responding to a point, the discussion had already moved on. There were too many discussions occurring at the same time for the majority (59%) of students to be able to keep track of them all, and three-quarters (77%) felt that particular individuals had dominated online discussions.

Browne's (2003) cyber-ethnographic approach revealed related problems. The 12 students she studied found their conference site complicated, problematic and frustrating and a number of students complained in open discussion that others were not participating as expected. On the other hand, she cited individuals who found that having time to consider and respond had helped them to commit their thoughts to the public arena and who welcomed the opportunity to reflect on practice with others around the world.

The constraints identified by these studies (Browne, 2003; McConnell, 2005) can potentially be associated with an assumption that learners have the same facility with asynchronous dialogue that they have with face-to-face speech. They therefore do not receive effective training in developing coherent online dialogue, in ordering online dialogue or in making sense of the responses (or non-responses) of others. Another possibility is that such constraints are inherent to the asynchronous medium, as are the benefits that the students also identified. Research has identified numerous advantages and constraints of asynchronous dialogue for learners, which support a nuanced understanding of the medium. These benefits and constraints can be associated with the various

affordances of this form of dialogue, which differ from those of speech and writing and have been shown to be affected by changes in context.

2.14 Affordances of asynchronous dialogue

As stated in the Introduction, this thesis takes affordances to be the perceived and actual properties of a thing, 'primarily those fundamental properties that determine just how [it] could possibly be used' (Norman, 1998, p9). Conole and Dyke (2004b) produced a taxonomy of the affordances of information and communication technologies (ICT), a set of tools which includes asynchronous dialogue. Their aim was to understand how these affordances can most effectively be used to support teaching and learning.

Each affordance of these tools was shown to have both positive and negative implications. Accessibility, for example, offers learners relatively easy access to large amounts of information. However, this can lead to information overload (Kear & Heap, 2007), so that learners must develop skills in selecting information as well as in searching for it. Online dialogue offers affordances that include new ways of collaboration and communication, but it can also produce problems as learners become over-committed or, conversely, lack engagement. Asynchronous communication provides increased opportunities for reflection, but in some situations these opportunities are counterbalanced by the speed of information change. If this speed is too great, it may leave no time for considered responses.

Researchers studying online learning have identified a variety of relevant affordances of asynchronous dialogue. These can be broadly classified in three groups: affordances of the technology, affordances of the medium and affordances of the dialogue. Each group of affordances offers advantages to learners but is also associated with constraints that have the potential to limit learning (Conole & Dyke, 2004a).

2.14.1 Affordances of the technology

Affordances of the technology are of particular interest to distance educators concerned with the co-construction of knowledge by groups of learners (Kaye, 1989). Asynchronous dialogue appears to provides the classic components of cooperation and collaboration – discussion, dialogue and community – without the traditional constraints of time and place (C. Jones, et al., 2007). It has been described as independent of both time and place, allowing access to and collaboration with experts and peers anywhere while allowing users to participate at a convenient and appropriate pace (Harasim, 1990a; Wu & Hiltz, 2004). Garrison and Anderson (2003) noted the time available in asynchronous environments to reflect, to be explicit and to order content and issues. They concluded that 'there is every reason to believe that text-based communication in an e-learning context would have advantages to support collaborative, constructivist approaches to learning' (p26).

A more negative view is that this presumed independence of physical and temporal settings constrains learners by reducing the range of physical cues available to them (Parks & Floyd, 1996). Important non-verbal signals such as bodily contact, appearance, posture, head-nods and gaze (Argyle, 1975) are not available. Without these, learners may find it difficult to judge the reliability and experience of their tutors and co-learners. In addition, interaction may be limited to task execution – thus limiting the development of social understandings (Kreijns, et al., 2003).

These 'Martini affordances' of the technology – any time, any place, anywhere – are not as clear-cut as they once appeared. Stanley (2001) demonstrated that online settings have a physicality that often goes unnoticed. Learners who engage in asynchronous dialogue are resourced and constrained by their physical setting: by their technology and their access to it, and by their need to sleep and eat at times appropriate to the time zone in which they live. In addition, they are not necessarily confined to the online environment. In

educational settings, learners and educators may use a variety of technologies to encounter each other face to face or online (Häkkinen & Järvelä, 2006), or may communicate with each other via phone, computer or handheld device while in the same room or sitting next to one another. Many learners first encounter each other online and then arrange to meet face to face, or vice versa (Sillence, 2005).

2.14.2 Affordances of the medium

Affordances of the medium vary according to the specific medium employed. In an online conferencing environment they include a transcript of the dialogue that can be consulted, edited and reworked (Kaye, 1989). The dialogue can contain hyperlinks to other resources and dialogue, and may also have documents, pictures, sound files or videos attached to it. Other affordances of the medium include the ability to link messages through threading, to identify participants through the use of icons, to store messages in folders, to monitor participation through the use of history, to share information through timetables and résumés, and to clarify input through the use of typography. As Section 2.11 showed, researchers have shown only limited interest in these affordances, although software developers are likely to flag them as selling points.

The constraints associated with these affordances are related to the extra work involved in developing expertise with software, hardware and the online environment. Learners need to spend time making sense of their computer-mediated learning environment with its associated routines and discourses, as well as developing ways of collaborating effectively in such an environment (Littleton & Whitelock, 2005). They also need to find ways of accessing their resources easily and of sharing and organising them over time (Cuthbert, Clark, & Linn, 2002). This work is additional to the manifest requirements of any course they are studying (Mann, 2003). They are therefore unlikely to develop familiarity with the

complete range of features of the software they use to mediate their discussion unless doing so is one of their learning objectives.

2.14.3 Affordances of the dialogue

Lapadat (Lapadat, 2000, 2002, 2007) identified a variety of affordances of asynchronous dialogue that may facilitate the construction of meaning. Learners' contributions are often dense with meaning and carefully crafted. Participants are able to order their own learning experience, they can be immersed in reading meaningful text, they have the opportunity to assess each other and they are usually required to develop a perspective and to think about the language they use. When learners have time to deliberate, their responses are more likely to be focused and purposeful (Davidson-Shivers, Tanner, & Muilenburg, 2000). Comparison of asynchronous and synchronous groups of learners showed student comments in the asynchronous group to be more elaborate, more thoughtful and more extensive (Bonk, et al., 1998). Analysis of students' asynchronous dialogue (Blanchette, 2001) demonstrated that having time to consult sources and check references meant they were able to provide each other with very accurate information. Blanchette also observed that the learners in her study were more likely to ask questions, ask for clarification and seek feedback than those studied in a face-to-face environment.

Häkkinen and Järvelä (2006) used questionnaires to elicit individual students' interpretations of their online learning, and these identified many affordances of the dialogue. These included: broadening thinking by exchanging thoughts and ideas, clarifying understanding by working in groups, facilitating learning by handling possible problems and unclear points in groups, becoming aware of others' thoughts and viewpoints, having to reconsider and justify their ideas in the face of counter arguments and working harder because of a feeling of responsibility to other group members. A

quarter of the students questioned [N=186] mentioned the opportunity for perspective taking, clarifying how different points of view are related to each other.

Although the affordances of the dialogue offer many potential resources to groups of learners, these are not necessarily harnessed to improve learning. Learners find it difficult to reach reciprocal understanding if collaborative interaction is confined to short discussion threads, or if other group members are displaying descriptive and superficial knowledge instead of searching for deeper explanations (Häkkinen & Järvelä, 2006).

Kanuka and Anderson (1998) found that, in a limited sample, students' interactions were primarily at the lower levels of communication: sharing information and discovering dissonance. Higher levels of communication involving negotiation, co-construction and agreement were rarely identified and the researchers raised concerns about the appearance of inconsistent and unchallenged ideas. The asynchronous nature of this dialogue makes it difficult to establish links between turns in the discussion, leading to the repetition of some input while other points are left hanging (Berge & Fjuk, 2006).

Interviews with students working online who had little or no previous experience of asynchronous dialogue indicated that the delays inherent in asynchronous communication limited the development of a dynamic online discussion, that the students did not experience this discussion as 'real' and that it left them feeling remote, detached and isolated (Bullen, 1998). These findings were reinforced by Mann's (2003) participant observation of an online course, which demonstrated that asynchronous dialogue can be a ponderous way of communicating, requiring great effort to express views subtly. Asynchronous dialogue moves on when some are offline; decisions are made without their input, and some participants may feel excluded by others (McConnell, 2005). When participants come back online they may be discouraged by the volume of messages awaiting their attention (Wegerif, 1998). Learners also lack the non-verbal 'back channel'

cues such as facial gestures and nonverbal vocalisations that support negotiation of meaning in face-to-face dialogue and mark points of maximum information content in a message (Goffman, 1981; Gumperz, 2001).

2.15 Setting affordances in context

Consideration of the affordances of asynchronous dialogue draws attention to the relevance of central sociocultural concerns: the situated, historical nature of the dialogue and its social setting. Affordances of the technology, medium and dialogue can either resource or constrain learners, depending on the contexts in which they and their dialogue are situated. Learners' perception of their context is related to their understanding of what they are doing and of how they are working together. Different ways of working change not only the form of their interaction but also what they can achieve together and how they do this.

Students who are learning together online may do so co-operatively or collaboratively. Both ways of working involve active learning in which students are stimulated to reflect on their assumptions and thought processes (Kreijns, et al., 2003). Co-operation is a goal-centred activity (Panitz, 1996) in which different things are done by different actors in order to achieve their goal (Van Oers & Hännikäinen, 2001). It involves splitting work, solving sub-tasks individually and then assembling the partial results to produce a final output. Because the majority of the work is done individually, this way of working makes limited use of the affordances of asynchronous dialogue.

Collaboration, on the other hand, involves partners carrying out work together (Dillenbourg, 1999). It is a co-ordinated activity, the result of a continued attempt to construct and maintain a shared conception of a problem (Lipponen, 2002); an interaction in which participants are focused on co-ordinating shared meaning (Crook, 1999). It requires more than the effective division of labour that constitutes cooperative work. Participants must negotiate mutually shared or common knowledge in order to work

together to solve a problem or perform a task together (Littleton & Häkkinen, 1999). It is also important that they understand the conditions for collaboration and rules for coordinating their efforts (Häkkinen, 2004).

This purposeful relationship can develop over time to support knowledge building (Murphy, 2004). In an online environment this developing relationship is closely linked to the use of asynchronous dialogue. Individuals initially introduce themselves and articulate their individual perspectives. At this stage they are aware of others, but do not necessarily reference their perspectives or solicit feedback from them. As they begin to accommodate and reflect on the perspectives of others, they challenge and refine those perspectives. When areas of disagreement or conflict become explicit, participants are able to restructure their thinking. As their own perspectives are challenged, they must work together to produce shared meanings. When they have developed shared meanings and shared goals, they are able to work together to produce a shared artefact.

Because collaboration requires sustained negotiation of understanding with other group members, and hence involves many activities that trigger learning, it is a form of working together that is well adapted to supporting the construction of knowledge in formal education. Murphy's analysis showed that successful collaboration is a complex process that involves the organisation of tools, resources, goals and a variety of affective concerns. All of these form part of the context in which learners engage in asynchronous dialogue, and therefore influence how they experience its affordances.

If learners are to make effective use of these affordances to support the co-construction of knowledge, they need appropriate skills and resources to engage effectively in online educational dialogue but may lack these if they have limited experience of online learning (Kreijns, et al., 2003). The importance of learning how to interact should not be underestimated. If learners are to collaborate online, they need to be able to use

asynchronous dialogue as a resource for negotiation, and they also need to be able to make sense of their learning environment with its associated routines, rituals and discourses (Littleton & Whitelock, 2005). They must learn how to organise themselves to build knowledge there, as well as how learning is performed in an asynchronous group.

Students can find that making sense of one another's actions is a constant struggle in an online environment, especially if they have difficulty working out who people are addressing and to whom they are responding (Olson & Olson, 2000). Group members require skills that allow them to agree on processes for decision making, group roles, timetables and deadlines, as well as expectations about time commitment and the frequency, timeliness and tone of contributions (Mitchell, 2007). They need to be able to arrange meetings, organise resources, present designs, review peer progress and visualise information (Cuthbert, et al., 2002). They must also develop online equivalents of the conventions that prevent people in face-to-face meetings from talking over one another, ignoring a meeting or holding unrelated conversations (Goodfellow, 2003). The need for online social skills is important because, if the socio-affective conditions do not support productive interaction, groups may fragment rather than work together.

In asynchronous settings, relational cues emanating from the physical environment are largely absent, as are nonverbal cues about vocal qualities, bodily movement, facial expression and physical appearance (Parks & Floyd, 1996). Asynchronous groups of learners must use their dialogue to construct and negotiate the social understandings and context that will allow them to understand each other and to work together successfully (Kreijns, et al., 2003). Those working in a face-to-face setting have opportunities to do this in private, in locations outside the classroom and away from the teacher. However, if asynchronous groups of learners do not have access to a shared social space (Kreijns, Kirschner, Jochems, & van Buuren, 2004) they face the challenge of sharing social

information in their work environment, where both colleagues and tutors can observe all their contributions and exchanges.

In the absence of adequate social information, some individuals take on roles which do not support other group members or which hold them back. Some act as 'lurkers'; they read messages and may act on them or send individual replies but their participation, if any, is not evident to the group (JonKatz, 1998; Nonnecke & Preece, 2001). When learners have limited time to interact, they may be forced into this position (Mitchell, 2007). 'Free riders' are most common in large groups; they consider that other members of the group can progress without their help, so they see no need to contribute (Mitchell, 2007). 'Social loafers' realise that the free riders are profiting from others' efforts and therefore lack motivation to work to improve group performance (Karau & Williams, 1993). Eventually, productive members of the group feel they are being treated as 'suckers' because they are doing all the work, and therefore reduce their effort, while others withdraw because they perceive that cliques are forming (Kreijns, et al., 2003; Mitchell, 2007).

Students working in asynchronous environments frequently ascribe negative characteristics to their colleagues, describing them, for example, as 'unresponsive, unhelpful, undisciplined, off-putting, intimidating and critical, with a tendency to show off or to moan' (Ferguson, 2005, p38). These negative impressions discourage learners from working together effectively. Burnett et al (2001) found that if individuals are offered information by someone they have identified as non-desirable they will not willingly accept that information, even if they need it.

In addition to roles and appraisals that reduce motivation, online groups may employ a range of negative behaviours. These include 'flaming' or hostile message content, 'spamming' others by sending the same message multiple times and 'trolling', which involves asking an apparently naïve question in order to provoke flaming (Herring, 2005).

These behaviours can quickly escalate into 'flame wars', vituperative discussions which are irrelevant and disruptive (Pfaffenberger, 1996). Such behaviours have been linked to social factors; specifically to situations in which anonymity is high and social accountability is low (Dibbell, 1993; Suler, 1997).

As in other settings, the availability of negative roles and behaviours online is counteracted by the availability of positive and productive roles and behaviours. Lapadat (2007) carried out a detailed examination over time of tutors and learners working in asynchronous conferences on a university course. She found that their use of a range of discursive techniques enabled them to establish groups successfully. These techniques included specifically social contributions such as greetings, humour, remarks with a social intent, references to social interaction outside the course discussion space, remarks that humanised or personalised an academic topic and anecdotes in which they revealed something about themselves. They made references back to past experience, employed familiar terms and genres, echoed terms coined by other participants, offered praise and support and aligned themselves with one or more participants using inclusive language such as 'we' and 'us'. They also made reference to the group's future by asking for help and by inviting others to comment on their input.

Successful online groups, like their face-to-face counterparts, therefore have to work to ensure that all members are engaged and participating. Doing this involves developing forms of leadership, support for members, information resources, governance structures and ways of acknowledging members' achievements (A. Jones & Preece, 2006). These can be used to develop a setting in which students feel inspired, motivated and supported to test their ideas (Browne, 2003). The organisational skills required by online learners are therefore linked with affective conditions. In this context, affective refers to

> anything pertaining to the emotions. This, in effect, means anything that is not cognitive (in essence, affective is the opposite to intellectual). Examples of affective factors include motivation, attitudes and perceptions. (Issroff, 1995, p5)

2.16 Asynchronous dialogue and affective conditions

Collaborative learners need to be able to reflect, compare their understandings with others and revise the knowledge pooled in the discursive process. This process necessarily gives rise to conflicts and misunderstandings. To engage in these activities, learners must be willing to share understandings and to keep doing so despite disagreements and conflicts. This is easier when they feel obliged to each other, stay with each other and maintain togetherness (Van Oers & Hännikäinen, 2001). Learners should feel that they can reveal their feelings, assumptions and knowledge without the risk of being treated poorly by their fellow participants (Häkkinen, 2004). If they are able to do this, they may be willing to use the expression of emotions to address an issue or solve a problem, or to use self-disclosure to support processes of exploration (Vass, Concannon, LeVoi, Littleton, & Miell, 2007).

Online educational environments guide social interaction towards critical thinking or towards argumentation, in which conflicting views are presented, sometimes forcefully, with the intention of reaching a resolution. At the same time, learners are often guided away from social talk classified as ‘off-task behaviour’. Even educators with a strong sociocultural perspective and an awareness of affective issues may report positively on low levels of ‘off-topic discussion’ (Ravenscroft, 2007). They are therefore unlikely to encourage off-task communication or impromptu encounters in task and non-task contexts. This problem is more salient and critical online than offline, partly because the environment affects the type of messages exchanged and how they are interpreted; partly because the environment is predominantly used for task execution rather than for social communication and partly because learners often do not know each other and have no

shared history (Kreijns, et al., 2003). Online learners may therefore lack opportunities to gain affiliation, support and affirmation (Kreijns, et al., 2003).

There is evidence from studies of face-to-face settings that attending to these affective and relational aspects has a positive effect on learning. Students benefit when they have opportunities for informality and playful behaviour (Chester & Gwynne, 1998) because relational work is an essential part of establishing and maintaining the relationships in which productive teaching and learning exchanges are possible (Littleton, et al., 2005). They also benefit when educators work to avoid the development of negative affective factors such as fear or anxiety, factors that reduce the zone in which effective teaching/learning occurs (Mahn & John-Steiner, 2002).

2.17 Temporal dimension of asynchronous dialogue

In Sections 2.1-2.16, this literature review has dealt with learning's social nature, even when individuals are separated by time and space. It has also considered the co-construction of knowledge with the help of meaning-making tools such as language. For online learners, asynchronous dialogue has been shown to be an important meaning-making tool with affordances that both resource and constrain the co-construction of knowledge, depending on context. This form of dialogue has been shown to differ from speech in both its textual and its temporal nature.

This section returns to the relevance of the temporal context. It emphasises the importance of this context and shows why there is a need to investigate how groups of learners use asynchronous dialogue to build shared knowledge over time. Such an investigation addresses 'a key problem for researchers concerned with explaining how talk is used for the joint construction of knowledge (or, indeed, with understanding how conversational communication functions at all) […] understanding how speakers build contextual foundations for their talk' (Mercer, 2008, p55).

Twenty years ago, experimental studies suggested that the reduced social context cues available online (Sproull & Kiesler, 1986) meant that computer-mediated communication should be characterised as a 'lean medium' (Walther, Anderson, & Park, 1994, p57) as opposed to the rich medium of face-to-face communication with its immediate feedback and nonverbal elements. Walther (1996) showed that this characterisation was not appropriate; online communication differed from face-to-face communication in the rate of social information exchanged, rather than in the amount of social information exchanged. When he took into account the temporal aspects of computer-mediated communication, he was able to identify circumstances in which computer-mediated communication surpassed the level of affection and emotion in similar face-to-face interactions.

Contemporary study of asynchronous dialogue in a learning context has drawn attention to its potential affordances without situating these firmly in their social and temporal contexts. This is often because the focus is not on asynchronous dialogue, but on the mediating technology, on the dialogue alone, or on its relation to text, speech or synchronous dialogue. Practical benefits such as time independence and place independence, and cognitive benefits such as opportunities for reflection and perspective sharing, are often assumed to be inherent to asynchronous dialogue as a tool although, in practice, they only apply in certain conditions and settings.

Sociocultural research emphasises that time is an important dimension of educational experience, and that dialogue is vital to the process of building knowledge over time:

> As learning is a process that happens over time, and learning is mediated through dialogue, we need to study dialogue over time to understand how learning happens and why certain learning outcomes result. (Mercer & Littleton, 2007, p115)

However, Mercer and Littleton (Mercer, 2008; Mercer & Littleton, 2007) also note that the temporal dimension of educational dialogue has not been given the attention it deserves, even by those working within a sociocultural framework. They cite two main difficulties

that have restricted the temporal analysis of educational dialogue. First, gathering relevant data requires a substantial time commitment by researchers. Second, the collected data will necessarily be incomplete, because the observable features of any interaction are likely to be rooted in previous, unrecorded interactions. Although these difficulties are substantial in a face-to-face situation, they are greatly reduced in an asynchronous environment, where a permanent record of most group dialogue is produced automatically.

Understanding how speakers build contextual foundations for their talk can be done only in a partial, limited fashion in the classroom by researchers sampling discourse over time and drawing in their analysis on the common knowledge they share with the speakers (Mercer, 2008). Once again, this research becomes more feasible when the focus is on asynchronous dialogue rather than on talk, because the majority of interaction that takes place within online groups of learners is preserved in archives and computer-generated transcripts.

As yet, there is little literature about the temporal aspects of asynchronous online learning. Harasim (1990a) referred to 'time-independent communication' as one of the key attributes of online education, but the hundreds of citations of this phrase have added little to her nuanced accounts of the potential advantages and disadvantages of asynchronicity. While studies of interaction, meaning-making and cognition in these environments (Lapadat, 2002; Littleton & Whitelock, 2005; Schrire, 2004, 2006) necessarily employ notions of change, progression and development, their focus is not on aspects of temporality. Those interested in the affective and community elements of asynchronous learning have taken temporality into account (Brown, 2001; Haythornthwaite, 1998, 2002; Haythornthwaite, et al., 2000; Jones & Issroff, 2005) but their research questions have not been directly concerned with time and, as a result, their descriptions of this dimension are limited and not as theoretically developed as in, for example, the classroom studies of Littleton and Mercer (Mercer, 2000; Mercer & Littleton, 2007).

The limited evidence available suggests that the conversational or discursive devices and the cohesive ties used by learners and teachers to move experience and information across time in asynchronous dialogue differ substantially from those identified by researchers in face-to-face situations. Lapadat's study of online learners (2007) is important in this context, but it is based on data from a group of only seven students. It is also limited in that it makes little reference to visually oriented aspects of the text and is primarily concerned with conference postings, omitting other asynchronous exchanges.

In face-to-face situations, learners modify their talk over time in relation to their context and their understanding of what they are doing. Because they use speech, which is 'not simply perishable but essentially evanescent' (Ong, 1982, p32) they face the double challenge of pursuing a line of thought systematically and then preserving their understanding of what has been achieved. They employ discursive devices to overcome these challenges, shaping transient speech into shared knowledge (Mercer, 2000).

In an asynchronous setting, learners do not need to employ these devices to help them to remember what they have said or done, because they have access to the complete text of their past dialogue in the transcript automatically generated by the software (Kaye, 1989). Their concerns are different; they must find ways of replacing face-to-face methods of linking conversational turns with methods of binding their postings together to form coherent dialogue. They also need to find ways of agreeing on what they have achieved together and on how they can jointly shape past dialogue to build shared understanding. At the same time, they must adapt to the pace and timing of asynchronous interaction, with its significant time delays between conversational turns (Light & Light, 1999).

2.18 Research questions

Despite the importance of temporality to learning, little is known about how asynchronous dialogue can be used to co-construct knowledge over different periods of time, taking full

advantage of the affordances of this tool and avoiding their potential constraints. It is therefore important to answer the central research question of this thesis:

- How do groups of learners use asynchronous dialogue to build shared knowledge over time?

A sociocultural approach to this question suggests a situated focus on groups of learners and on the interdependence of feeling, thought and action – it is through interaction that new skills and understandings are developed, carried forward and passed on. This interaction is linked to the aims, feelings and motivations of participants. All these change over time, as do collaborators' access to and ways of using their tools. Analysis therefore needs to take into account learners' emotional and temporal contexts.

In order to do this, this thesis addresses three subsidiary research questions in order to answer its main research question. These questions are:

- How do groups of learners co-construct shared knowledge by building links across postings in asynchronous dialogue?
- How do groups of learners, working together in asynchronous environments, negotiate and attempt to avoid unproductive interaction?
- How do groups of learners preserve and utilise elements of asynchronous dialogue over periods of weeks or months in order to develop their understandings?

The literature examined above helped to identify these questions, and is also employed to help answer them. In addition, the study employs key analytic concepts that were developed to understand the co-construction of knowledge in face-to-face environments. These are the social modes of thinking identified by Mercer and his colleagues (Mercer, 1995, 2000, 2002; Mercer & Littleton, 2007; Mercer & Wegerif, 1999), and the progressive dialogue and improvable objects described by Wells (1999). These analytic concepts are considered in detail below.

2.19 Social modes of thinking

To understand how small groups of learners build knowledge together in the classroom, Mercer and his colleagues (Mercer, 1995, 2000, 2002; Mercer & Littleton, 2007; Mercer & Wegerif, 1999) built upon the work of Barnes and Todd (Barnes, 1976; Barnes & Todd, 1977). In doing so, they distinguished three social modes of thinking that are used by groups of learners in face-to-face settings: disputational, cumulative and exploratory talk. They employed this characterisation of types of educational dialogue as an analytic tool within their research.

Many other analytic tools have been developed to make sense of how learners build knowledge together in face-to-face settings. These are considered below, but they are not employed here. In some cases, this is because they are task focused and therefore tend to exclude or ignore learning about tools, the environment, people or relationships. In other cases it is because they are designed for a classroom environment in which the teacher takes the lead, rather than for group discussion.

Argumentation, for example, can be described as ‘a reasoned debate between people, an extended conversation focusing on a specific theme which aims to establish “the truth” about some contentious issue’ (Mercer, 2000, p96) and is thus task focused. Collaborative reasoning, which includes challenges, evidence and evaluation, is specifically a taught approach (Anderson, Chinn, Waggoner, & Nguyen, 1998). ‘Effective discourse’ is also teacher led, being dependent on the educator to create a situation in which participants can ‘advance beliefs, challenge, defend, explain, assess evidence and judge arguments (Mezirow, 1997, p10). Accountable talk is similar, including elements such as listening, clarification, extension and elaboration (Michaels, et al., 2008; Resnick & Helquist, 1999). Once again, though, it is restricted in its account of other talk between learners.

Descriptions of disputational, cumulative and exploratory talk in the classroom have the advantage that they not only deal with the productive interaction that helps the group to extend its understanding and to achieve its goals, but they also deal with the unproductive interaction that makes a group less likely to achieve its goals. Although these types of talk were first identified in the context of learners working together at computers, rather than interacting through them, their characteristic elements are also observable in online discussion. Littleton and Whitelock (2005) made use of them to investigate the negotiation of meaning within a postgraduate learning community, where they proved useful for the investigation of coherent dialogue because they provided a description of three social modes of thinking. These social modes of thinking are therefore referred to here as cumulative, disputational and exploratory *dialogue*, rather than talk, because their characteristic elements can be observed both online and offline.

2.19.1 Disputational dialogue

Disputational dialogue is discouraged in educational settings because it is unproductive (Mercer, 2000). Individual students may employ it in an attempt to take control of a group, repeatedly restating their own point of view while refuting or ignoring the views of others. This form of dialogue

> is characterized by disagreement and individualized decision making. There are few attempts to pool resources, or to offer constructive criticism of suggestions (…) Disputational talk also has some characteristic discourse features, notably short exchanges consisting of assertions and counter-assertions (Mercer, 1996).

These exchanges typically lack a clear resolution, or else come to a resolution that is not supported by agreement (Littleton, et al., 2005). They may involve insults, threats or, in extreme cases, even fights (Wegerif, Mercer, & Dawes, 1998). There are few elaborations and limited attempts to offer constructive criticism. Differences of opinion are highlighted

rather than resolved and information is flaunted rather than shared (Mercer, 1996; Mercer, et al., 1999).

Disputation should not be confused with argumentation, in which conflicting views are presented, sometimes forcefully, but the intention is to reach a resolution. Neither is it the same as socio-cognitive conflict, in which the presentation of challenges and variant perspectives has the potential to move the discussion on (Hinde, Perret-Clermont, & Stevenson-Hinde, 1985a, 1985b). Disputational dialogue does not support the learning of collaborative groups because it is, by definition, unproductive.

2.19.2 Cumulative dialogue

Cumulative dialogue is much more constructive. In cumulative exchanges control is shared. Speakers build on each other's contributions, adding their own information and constructing a body of shared knowledge and understanding, but they do not challenge or criticise each other's views.

> Speakers build positively but uncritically on what the others have said. Partners use talk to construct 'common knowledge' by accumulation. Cumulative talk is characterized by repetitions, confirmations and elaborations (Mercer & Littleton, 2007, p59)

Because learners build on the contributions of themselves and others, cumulative dialogue is not the same as extended talk, which increases in length without developing (Alexander, 2005). In situations where a learning task does not require explicit reasoning, cumulative dialogue offers many advantages because learners may carry out coordination, negotiation and collaboration through this medium (Rojas-Drummond, Mazon, Fernandez, & Wegerif, 2006). In other situations, cumulative dialogue has the potential to develop into exploratory dialogue, because the use of open questions such as 'What?' or 'Why?' provokes a shift towards a more exploratory attitude (Wegerif, 2008b).

2.19.3 Exploratory dialogue

Of these three forms of social thinking, exploratory dialogue is the type considered most educationally desirable by teachers (Wegerif, 2008b). Learners who engage in exploratory dialogue constantly negotiate control, engaging with each other's ideas both critically and constructively. Mercer and Littleton described it in a school environment:

> Exploratory talk represents a joint, coordinated form of co-reasoning in language, with speakers sharing knowledge, challenging ideas, evaluating evidence and considering options in a reasoned and equitable way. The children present their ideas as clearly and as explicitly as necessary for them to become shared and jointly analysed and evaluated. Possible explanations are compared and joint decisions reached. By incorporating both constructive conflict and the open sharing of ideas, exploratory talk constitutes the more visible pursuit of rational consensus through conversation. Exploratory talk foregrounds reasoning. Its ground rules require that the views of all participants are sought and considered, that proposals are explicitly stated and evaluated, and that explicit agreement precedes decisions and action. It is aimed at the achievement of consensus. Exploratory talk, by incorporating both conflicting perspectives and the open sharing of ideas, represents the more visible pursuit of rational consensus through conversations. It is a speech situation in which everyone is free to express their views and in which the most reasonable views gain acceptance. (Mercer & Littleton, 2007, p62)

Exploratory talk involves principles of accountability, clarity, constructive criticism and receptiveness to well argued proposals. It thus embodies qualities that are essential to many educated discourses. This does not mean that it is automatically produced in educational environments. Little extended reasoning by talk is observable in most classrooms (Mercer, 2008; Mercer & Littleton, 2007) and students may not understand how dialogue could help them to interrogate, reflect or revise ideas (Ellis, Goodyear, O'Hara, & Prosser, 2007).

Although learners can be supported in using exploratory dialogue to construct knowledge together (Wegerif & Dawes, 2004), structured support of this type rarely takes place in learning environments. Even when learners have received such support, in order to engage in exploratory dialogue, with its negotiations, criticisms and judgments, they must feel

secure enough neither to defend their position by automatically rejecting others' views as in disputational dialogue, nor to accept group solidarity uncritically by not challenging views, as in cumulative dialogue (Wegerif, 2006). They need to feel able to reveal their own assumptions and knowledge without the risk of being treated poorly by their fellows (Barnes, 1976; Häkkinen, 2004). They must also be happy to test the validity of their own point of view, as well as that of their partners and to work together to construct explanations, answers or solutions.

Learners' ability and willingness to use exploratory dialogue as a powerful knowledge-building tool are therefore dependent not only on good teaching, but also on social and affective considerations that involve building relationships over time. The types of dialogue in which they engage are linked to their understanding of the activity in which they are engaged. If their focus is on claiming or asserting status and they are not concerned with working collaboratively, they may opt for disputational dialogue. If they are working towards a fixed objective, cumulative dialogue will suffice. On the other hand, if they are working to develop 'a new understanding that everyone involved agrees is superior to their own previous understanding' (Bereiter, 1994, p6) then exploratory dialogue becomes more important. These affective and contextual factors help to explain why some learners restrict themselves to cumulative dialogue or limit their ability to construct knowledge together by employing disputational dialogue.

Employing an unproductive form of dialogue that preserves individual viewpoints unaltered and that involves unconsidered opposition to the views of others is evidently not ideal for learners whose goal is to construct knowledge together. Nevertheless, disputational dialogue is commonly found in settings where the aim is collaborative learning (Mercer, 2000). Rojas-Drummond and her colleagues (Fernandez, Wegerif, Mercer, & Rojas-Drummond, 2001; Rojas-Drummond, Perez, Velez, Gomez, & Mendoza, 2003) found that up to 9.5% of the talk of the school children they studied was

disputational and that this proportion increased as groups of children were presented with more challenging problems to solve together.

The frequency with which disputational dialogue is used in situations that are intended to stimulate collaborative learning suggests that, although it does not benefit groups of learners, it may have functionality for individual group members in certain circumstances. This is the case if learners perceive themselves to be in a competitive, rather than collaborative, relationship with others. In this case, disputational dialogue may emerge as they work to establish status within a group or to defend themselves against real or perceived threats from other group members (Fernandez, et al., 2001; Mercer, 1996; Mercer, et al., 1999; Sarmiento, Tausan-Matu, & Stahl, 2005).

Disputational dialogue may also emerge in situations in which students can see little or no advantage to working as a group member but either benefit from working individually or are concerned to preserve their individual views (Fernandez, et al., 2001; Mercer, 1996; Rojas-Drummond, et al., 2003). In some cases, learners may try to identify dominant characters in their group, because they see no other way of reaching agreement. In such cases, disputational dialogue may help to establish dominance (Hoek & Seegers, 2005).

If learners do not feel comfortable and confident, they may choose not to engage in any form of dialogue. Instead, they may withdraw for a period, ignoring the contributions of others and refusing to contribute (Azmitia, 2000). Many of the roles associated with low levels of collaboration in groups of learners are produced by silence rather than by dialogue. Lurkers, social loafers and free riders are silent, not disputational, roles. However, online silences are difficult to interpret. If learners receive no feedback they may feel isolated, unnerved and ignored (Wegerif, 1998).

This may not be the intention of others; the silence of individuals may be due to them taking time out from collaboration to reflect without the distraction of attending and

contributing to the ongoing discourse (Azmitia, 2000). As a result, their later contributions may be useful and considered (Golay Schilter, Perret, Perret-Clermont, & de Guglielmo, 1999; Littleton, 1999). Breakdowns in communication can also be used to work out an idea, reassess a position or reduce negative affect and allow more positive reconnection (Azmitia, 2000). Because they are linked to cognitive progress and to the development of socio-affective factors that promote collaboration, they have a role to play in the development of positive interaction (Scanlon, Issroff, & Murphy, 1999). In all these cases, silences form part of the rhythm of extended productive interaction.

If the affective conditions of an educational setting do not support interaction, learners may struggle to take control and to work towards their own goals (Crook, 2000), especially if frustrations with task or with each other lead to breakdowns in a group's communication and interaction (Azmitia, 2000). However, conflict between learners is not necessarily unproductive because the challenges and counter-challenges of socio-cognitive conflict are important for the development of knowledge. Exploratory dialogue is likely to involve the confrontation of different approaches in socio-cognitive conflict. Such conflict may result in different views being coordinated to form a new approach, more complex and better adapted to solving the problem (Doise, 1985). In such cases, conflict and difference between individuals are brought into productive play to support learning (Daniels, 2007).

To avoid any need to engage in disputational dialogue, it is important that learners feel confident enough within their group to engage both critically and constructively with each other's ideas (Mercer, 2000). Individuals are more comfortable voicing dissent within the context of a personal or working relationship because their concerns about rejection are limited, they know that unresolved conflicts can be reconsidered in the future, and they may be bound by a commitment to reciprocity and mutual respect (Azmitia, 2000). When affective conditions are suitable, learners are able to provide mutual support to group members by engaging in cumulative dialogue. Mercer associated this type of talk with an

'uncritical, non-competitive and constructive relationship' (Mercer, 2000, p173) and Wegerif (2006) linked it to feelings of group solidarity.

The use of disputational, cumulative and exploratory dialogue is therefore related to learners' understanding both of what they are doing and the context within which they are doing it. Collaborative learning is 'an experience with a distinctive and important emotional dimension' (Crook, 2000, p162) and a sense of togetherness motivates individuals to collaborate (Van Oers & Hännikäinen, 2001).

Other contextual features influence the ability and willingness of groups of learners to employ cumulative or exploratory dialogue. Kanuka and Anderson (1998) and Zhu (2006) found that online students typically confined themselves to sharing and comparing information or to the discovery and exploration of dissonance or inconsistency. These brief, descriptive exchanges can be classified as cumulative, but they do not make full use of the affordances of cumulative dialogue, because learners do not take opportunities to elaborate and build on the work of others.

Temporal context also affects groups' use of dialogue because practices develop and change over time (Crook, 1999; Kovalainen & Kumpulainen, 2007). When learners are committed to building knowledge together, collaboration can involve increasing intimacy as they negotiate an expanding set of shared experiences (Crook, 2000). Rasmussen (2005) found that the forms of talk she observed changed over time as learners' perspectives converged or diverged. In an asynchronous textual environment, where all contributions are preserved and, consequently, individual postings are difficult to locate, learners may prioritise contributions according to chronology rather than content. This leads to learners treating the most recent and accessible contributions as the most pertinent. In order to collaborate successfully, groups need to develop robust methods for reworking, recasting and remobilising what they have achieved together in the past (Mercer, 2000).

2.20 Progressive discourse and improvable objects

Mercer shares an interest with other sociocultural researchers in how knowledge and educational experience are built up across time. They identify several techniques that are used to move information and experience across time. Lemke (2001) showed that semiotic artefacts can be used to transfer information between events that are separated by time. However, because Lemke's analysis takes into account timescales ranging from fractions of a second to billions of years, 'semiotic artefacts' is a broad category. Paavola, Hakkarainen and Sintonen identified a trialogic process of inquiry involving mediating objects in which 'the inquirer, other inquirers (the community), and the object of knowledge are inextricably bound up with each other in long term processes of inquiry' (Paavola, Hakkarainen, & Sintonen, 2006, p137). They related this to distributed cognition in which inquirers use resources as a guide in their search for new ideas.

'Mediating objects' and 'resources' take into account the movement of information and experience over time, but they do not allow subtle distinctions to be made between time periods. In the narrower context of educational dialogue, Wells' 'improvable objects' form a useful subset of these groups. The Introduction summarised these as knowledge artefacts that participants work collaboratively to improve because they involve a problem that requires discussion. The improvable object is an analytical construct that was developed to help explain how learners are able to develop ideas over time. It is associated with the use of 'progressive discourse' (Wells, 1999), a method of developing ideas through speech.

This form of discourse is described by Bereiter (1994) as discussion that is aimed at increasing group members' understanding. Wells (1999) follows Bereiter in identifying four commitments which those engaged in progressive discourse must make: to work toward common understanding satisfactory to all, to frame questions and propositions in ways that allow evidence to be brought to bear on them, to expand the body of collectively

valid propositions and to allow any belief to be subjected to criticism if this will advance the discourse. The first three of these commitments can be achieved by the use of cumulative dialogue but, to meet every one of these commitments, participants must engage in exploratory dialogue. Progressive discourse therefore necessitates the use of exploratory dialogue and, in turn, the use of exploratory dialogue signals that speakers are likely to be engaged in building understanding together through progressive discourse. Analytical frameworks that deal with progressive discourse and exploratory dialogue thus have similar concerns. However, because progressive discourse is associated with the sustained development of improvable objects over time (Wells, 1999), it can be understood as a longer-term activity than exploratory dialogue.

Wells observed that teachers often encourage pupils to construct representations capturing something of what has been said. He suggested that these function as improvable objects. These are important resources because 'a written text, unlike the text produced in speaking, is a permanent artefact, it can be reviewed, rethought and revised through a different form of dialogue, in which the text under construction plays a central role' (Wells, 1999, p115).

This might be taken to imply that learners have less need for improvable objects in the context of a computer-mediated environment in which contributions endure and are visible to all. However, the needs to establish 'common knowledge' (Edwards & Mercer, 1989) and to preserve salient ideas are keenly felt in an online environment where there is a danger that learners will become overloaded with information because dialogue is automatically archived (Conole & Dyke, 2004b). Asynchronous learners need to have methods of reviewing, rethinking and revising their knowledge through dialogue. They also need to be able to identify, augment and maintain common ground as their work progresses (Baker, et al., 1999) and improvable objects offer a way of achieving this.

Resources available to groups can be characterised as improvable objects if they meet certain criteria (Wells, 1999). They must be knowledge artefacts that participants work collaboratively to improve because they involve a problem that requires discussion. They must act as a focus for the application of information and experience by the group. Unlike many assessed assignments, an improvable object must provide a means to an end, rather than being an end in itself. Finally, an improvable object must be both the inspiration and the focus for progressive discourse. Examples of improvable objects given by Wells include: a building constructed of straws and paperclips to be as tall and stable as possible, a class newspaper and a multi-media representation of a group's theory.

The improvable objects described by Wells, and previously described by Bereiter and Scardamalia (1996) as improvable human constructions, can take many forms. Although the word 'object' implies physicality, Bereiter and Scardamalia's examples include theorems, structures, algorithms, proofs, explanations and justifications. Wells therefore refers to improvable objects as 'knowledge artefacts' rather than simply as 'artefacts' (Wells, 1999). However, when these improvable objects are considered worthy to be preserved or to be shared beyond the immediate group, they are likely to be recorded and, in many cases, this will involve textual representation. The key elements of improvable objects – a problem that provides as a means to an end, inspires progressive discourse and acts as a focus for the application of experience and information – can therefore all be assembled in asynchronous settings to support the shared construction of knowledge.

Other researchers have described physical representations of understanding in ways that differ from improvable objects, either because they are fixed representations or because they are individual. Inscriptions, for example, resemble improvable objects in that they focus meaning on artefacts such as texts or diagrams (Latour, 1986). However, inscriptions remain immutable items, available for recombination but not reconstruction, whereas improvable objects may be recombined, reworked and reconstructed.

Collaborative resources such as lecture notes (Crook, 2002) and semiotic tools such as information books (Varelas & Pappas, 2006) also resemble improvable objects. However, although such resources and tools inspire dialogue and take ideas forward, they remain fixed representations of the past (Crook, 2000). By contrast, improvable objects are dynamic representations of a changing situation. They also differ from personal notes or sketches that support individual understanding but are not shared with others, because they are a collaborative resource (Azmitia, 2000).

Improvable objects are more akin to the rough drafts that Vygotsky (1987b) described as a powerful means of reflecting on work. Not only do they support the development of understanding by groups of learners, but they are also developed as part of that progress. They are a means of sharing and building ideas over time; sites not only for the display and comparison of different understandings but also for their manipulation and development.

2.21 Summary

This literature review has located this thesis in term of a sociocultural perspective on learning. It takes the view that learning is fundamentally social in nature, and that knowledge is not a static entity, but is co-constructed by learners with the help of meaning-making tools. In the case of groups of online learners, knowledge-building activity is mediated by asynchronous dialogue. This meaning-making tool offers a variety of affordances related to the technology, the medium and the dialogue. The advantages of these affordances are sometimes considered to be inherent to the use of asynchronous dialogue as a tool. However, whether they are experienced as resources or constraints depends on learners' social and temporal contexts.

It follows that a study of the construction of knowledge through asynchronous dialogue needs to focus on the interactions of groups of learners, rather than on the actions of individuals. Furthermore, the process of knowledge building is situated socially and

temporally, and cannot be assumed to be the same over different periods of time or at different stages in a group's development.

Using asynchronous dialogue as a meaning-making tool presents learners with specific challenges. They must adapt to the pace and timing of asynchronous interaction, develop methods of binding their postings together to form coherent dialogue, and find ways of agreeing both on what they have achieved together and on how they can jointly shape dialogue to build shared understanding over time.

While several previous studies have demonstrated that temporal context is important to online learners, little previous research has gone on to investigate how groups of learners make use of the affordances of asynchronous dialogue to build knowledge together over different periods of time, ranging from minutes to weeks. This thesis seeks to fill this gap in the literature by answering a central research question 'How do groups of learners use asynchronous dialogue to build shared knowledge over time?'

In order to relate the answer to this question to the different social and temporal contexts of learners, this thesis also addresses three subsidiary questions: 'How do groups of learners co-construct shared knowledge by building links across postings in asynchronous dialogue?', 'How do groups of learners, working together in asynchronous environments, negotiate and attempt to avoid unproductive interaction?' and 'How do groups of learners preserve and utilise elements of asynchronous dialogue over periods of weeks or months in order to develop their understandings?'

These questions arose from a study of the literature and were refined by carrying out a pilot study. The next chapter therefore describes the pilot study, showing how this influenced the concerns and methodology of the main study. It considers the ethics of this research and also discusses data collection, comparing the selection, collection and rationale of the different corpora used in the pilot study and the main study.

3 Methodology: pilot study

3.1 Introduction

After an initial review of the literature, a pilot study was carried out in order to investigate group learning in asynchronous environments. This involved secondary analysis of data collected by other researchers. It followed the example of earlier studies of learning in similar environments (Rourke, et al., 2003) and employed a content analysis approach (de Wever, Schellens, Vallcke, & van Keer, 2006; Strijbos, Martens, Prins, & Jochems, 2006) to a data corpus made up of postings from asynchronous course conferences associated with an undergraduate course.

This chapter describes the pilot study and its relevance to the main study. The importance of the pilot lies in its influence on the focus and methodology of the main research, and the areas considered here are therefore data selection, collection and methodology. The data corpus as a whole and the rationale for its selection are covered in detail, because the pilot study and the main study used data from the same Open University psychology course. Ethical issues are also considered in detail, both those relating to online research and more specific issues related to the pilot study, including those related to secondary data analysis. The chapter begins with a consideration of methodologies previously used to study asynchronous learning, and their relevance for this research.

3.2 Research methodologies

Asynchronous dialogue in educational settings offers a valuable resource to researchers because it is typically recorded in a full and detailed transcript that includes not only turns in the conversation but also who contributed them and when. The availability of complete educational dialogues in digitised form has encouraged quantitative approaches to analysis (Rourke, et al., 2003). As use of computers and the Internet became more common, researchers were concerned with the practicalities of online education, and so early quantitative studies focused on manifest elements of the data including number, origin and length of messages, time spent online and cost of access (Muzio, 1989; Riedl, 1989). Such studies imposed little 'interpretive burden' on coders because little observer inference was needed to relate information to the coding protocols (Hagelin, 1999; Rourke, et al., 2003). While this helped researchers to demonstrate reliability and validity in their analysis of the extent of online interactions, it meant that they had little to say about their quality.

To investigate the quality of online interaction, researchers have examined the latent elements of transcripts using content analysis. This form of analysis is used to consider the meaning underlying the manifest elements of the data, either by searching for objective patterns or by employing previous experience to interpret the content (Potter & Levine-Donnerstein, 1999). The method may be employed in a quantitative or qualitative fashion, but, according to Pidgeon, always 'emphasizes the criteria of reliability and validity and the counting of instances within a predefined set of mutually exclusive and jointly exhaustive categories' (1996, p78). Although these criteria can sometimes be legitimately set aside, particularly by qualitative researchers who recognise that each text 'affords multiple interpretations' (Krippendorff, 2004, p87); content analysis of online discussion has been persistently criticised because of 'the failure of researchers to adhere to the principles that make quantitative research valid' (Rourke, et al., 2003, 148) and it has

recently been noted that 'coherent and empirically validated content analysis instruments are still lacking' (de Wever, et al., 2006, p25).

Content analysis can be applied to a large data corpus – Mehanna (2004) applied it to five million words of online interaction – and can be used to answer a wide range of questions. This method has been used by cognitive, constructivist and social constructivist researchers to investigate diverse issues including types of learning, collaborative learning, presence and online cooperation (de Wever, et al., 2006).

This form of analysis appeared particularly appropriate for this study of online learning because the literature showed that it had been extensively used for the analysis of asynchronous conference data. It was therefore selected for use in the pilot study because it appeared to be an effective method of identifying changes in the focus of learners from one unit of analysis to the next. Other methods, including discourse analysis, social network analysis and ethnography are considered briefly below. These had been used to analyse similar data, but appeared less suited than content analysis to the investigation of the co-construction of knowledge online in the context of a short-term pilot study.

Discourse analysis provides a series of approaches to the large amounts of text generated in computer conferences. Schrire (2004) used it to understand the relationship between the interactive, cognitive and discourse dimensions of online interaction, but she confined herself to an examination of initiation, response and follow-up (IRF) exchanges. Lapadat (2007) has since demonstrated that discourse analysis can be a powerful tool for the study of online learning by applying it to asynchronous discussions between students and tutors and showing how groups of learners create and maintain community and coherence through the use of discursive devices. However, discourse analysis was not used in the pilot study because, at the time, it had rarely been applied to online conference data.

Other researchers concerned with the relational aspects of online learning have applied social network analysis to make sense of the relationships between groups of learners or of the flow of information between them (Thorpe, McCormick, Kubiak, & Carmichael, 2007). Such studies take relations between 'actors' as their unit of analysis, and deal with questions related to interaction, including the interactions that sustain collaborative relationships (Haythornthwaite, 2006), the links between interaction and cognition (Schrire, 2006) and the links between online interaction and learning (Zhu, 2006).

Social network analysis was not used in this pilot study because it relies on access to a complete dataset, which produces ethical challenges with regard to consent that are difficult to deal with within a limited timeframe. Although the communications of small online study groups appear well suited to this method, an initial reading of the data suggested that the social networks that supported these online learners were extensive and included family and friends whose contributions could not be assessed or accessed.

The elements of online education that are dealt with by network analysis, including interaction and learning, can be set in their broader context by the use of ethnographic approaches. Combining participant observation with interviews supports the investigation of issues that are not explicitly mentioned in a conference transcript (Mann, 2003; Wegerif, 1998). In the case of the pilot study, participant observation was impracticable due to time constraints, as it would have required locating a suitable course, negotiating access and collecting data over an extended period.

Previous studies therefore showed that content analysis, network analysis and ethnography can be useful for investigations of cognitive and social factors, although these studies had little to say about the organisational elements that are also necessary to resource learning. As in face-to-face settings, online groups need to identify goals, individual responsibilities and accountability and the communication and decision protocols they will use (Alpay,

2005). Because networked learning involves radically new discourse practices, learners must negotiate ways of working and ways of sharing experience (Mann, 2003). The pilot study was therefore designed to take into account organisational aspects of learning.

3.3 Pilot study

The primary intention of the pilot was to inform the design of the main study by trialling methods of data collection and by evaluating and developing the proposed methodology. The study was designed to investigate group learning in asynchronous environments by examining how the context of an online conference affects processes of learning together online. It therefore addressed the research question:

- In what ways do the organisational and social contexts of an online conference affect the co-construction of knowledge by small groups of learners?

The pilot study defined learning as a process of co-construction of knowledge and expected this process to involve task-focused interaction linked to the expected learning outcomes of a course. Organisational and relational requirements were taken to be significant elements of the context in which learners engaged in this interaction. To investigate these required a data set in which learners interacted together on a course, and a form of analysis that could identify not only when they were focused on knowledge construction, but also the contextual elements that could be seen to influence their knowledge-building activity.

As described in Section 3.2, content analysis was selected as the most suitable method of addressing this question. Although this is potentially a powerful tool, the validity and reliability of many previous studies using content analysis had been questioned. A review of 19 studies (Rourke, et al., 2003) found that this research technique had value for researchers, but pointed to the ‘failure of researchers to adhere to the principles that make

quantitative research valid. Characteristics such as objectivity and reliability are not accidental features of some studies; rather, they are important criteria for any studies using this technique' (Rourke, et al., 2003, p148). A subsequent review of 15 content analysis instruments (de Wever, et al., 2006) came to similar conclusions. In the case of both quantitative and qualitative studies, the reliability essential to quantitative content analysis in this context was shown to be lacking.

To avoid these shortcomings, the pilot study coding scheme was tested, developed and refined over a three-month period and both intra-rater reliability and inter-rater reliability were assessed. In addition, the study took a robust analytical framework as its model. The 'approaches to study' framework was selected to form the basis of a content analysis because its sensitivity to the links between context and learning had been demonstrated when it was employed in questionnaire-based research.

Approaches to study were first identified by Marton and Säljö (1976), who found that, by changing students' learning conditions, it is possible to modify how students approach subject matter, what they are looking for and what they focus on. Marton and Säljö distinguished between a surface approach focused on reproduction of material, and a deep approach focused on understanding. A third, strategic, approach in which the focus is on assessment outcomes was identified by Ramsden (1979). Approaches to study are not fixed but depend on many factors; students may apply one or all approaches in different contexts (Richardson, 2000) and learning context can therefore influence students' learning focus (Entwistle & Ramsden, 1983; Laurillard, 1979; Ramsden, 1979).

Several instruments have been developed to investigate students' approaches to study in order to relate these to learning context. The Approaches to Studying Inventory (ASI) and its revised form, the RASI, are validated survey instruments first developed in 1970 by Noel Entwistle and his colleagues at the University of Lancaster (for an overview, see ETL

Project, 2000) These inventories, designed to be administered to individual students and subjected to quantitative analysis, have proven success in linking students' approach to learning with their learning context (see, for example, Lawless & Richardson, 2002).

For the pilot study, a coding protocol was developed with reference to the RASI that could be applied directly to asynchronous online conference dialogue in order to identify students' approaches to study at different times. The RASI was used not as an inventory but as a resource to suggest areas in which different behaviours could be expected from students employing a deep, strategic or surface approach to study. Overall, a posting was considered to signal a deep approach to study if its writer demonstrated understanding, or a general interest in learning. A strategic approach was signalled by references to completing the course and meeting its criteria. Evidence of a surface approach, which the sub-scales of the RASI associate with fear of failure and extrinsic motivation, included expressions of anxiety or a focus on taking things easy.

In the case of each statement in the RASI related to a deep, strategic or surface approach to study, it was necessary to consider how the view that it expressed might be demonstrated in an online conference. For example, the RASI statement 'I often seem to panic if I get behind with my studies' was framed in the coding scheme as 'Expresses concern about work, marks or deadlines; struggles or seeks reassurance'. Coding the data in this way was intended to support a search for contextual factors associated with changes in approach. The coding scheme, together with notes for coders, forms Appendix A.

Drawing on the RASI, the scheme identified six areas in which students could be expected to demonstrate different approaches to study: references, course material, initiation of discussion or ideas, responses, interaction with tutor, and learning focus. In the case of references, for example, students were considered to be employing a deep approach to study if they demonstrated an understanding of academic writing, academic software or

statistics. This related to the RASI statement: 'I try to relate ideas in one topic to those in others whenever possible'. If students provided appropriate references without demonstrating understanding, they were considered to be demonstrating a strategic approach. This related to the RASI statements 'I'm good at following up some of the reading suggested in the course materials' and 'When working on a written assignment, I keep in mind how best to impress the tutor'. If students gave inappropriate references or stated that they could not locate references, they were classified as demonstrating a surface approach. This related to the RASI statements 'Much of what I'm studying makes little sense: it's like unrelated bits and pieces' and 'I concentrate on learning just those bits of information I have to know to pass.'

In order to investigate the affordances of asynchronous conferencing that support and impede the co-creation of knowledge in the online environment, it was necessary to apply the coding scheme to a data set in which learners interacted together asynchronously in an educational setting. Both the pilot study and the main study made use of data from the same course, albeit from presentations in different years, and so both the course and the data are described in detail in Section 3.5. The following sections address the collection of that data, and the ethical issues related to its collection and analysis.

3.4 Pilot study: data collection

The pilot study made use of data originally collected for research into social interaction and learning online (Vass, et al., 2007). These data were collected by members of the Educational Dialogue Research Unit (EDRU) at The Open University. The proposal for the data collection and for the original research was approved by Open University Human Participants and Materials Ethical Committee in December 2003 (Miell, et al., 2003).

Data were collected early in 2004, once consent forms had been signed by participants. These students and tutors were given details of the research, including its subject areas, the

data to be collected, how their data would be protected and their right to withdraw at any time. They were also made aware that their data would be made available to researchers investigating teaching and learning in electronic conferencing environments. Once informed consent had been obtained from all parties, conference postings were saved as Word files for analysis. With the agreement of the researchers who gathered and formatted these files, they were used in 2006 as the data for this pilot study.

Use of this data offered several benefits. Collecting a similar body of data would have been a time-consuming process, partly because the conferences ran for six weeks, partly because such courses are not always running and partly because of the time involved in securing access to such conferences and agreement from all participants. Use of this corpus meant that it was possible to examine different but related sets of data in the pilot study and in the main study. It also meant that problems experienced by previous researchers could be considered and, where possible, eliminated in the main study.

All data collection, storage and analysis, both for the original research and for the studies reported in this thesis, adhered to the British Psychological Society code of ethics and conduct (current version, BPS, 2006). The Open University Human Participants and Materials Ethical Committee's approval of the collection of data analysed in the pilot study was supplemented in October 2006 by The Open University Student Research Project Panel's approval of the research design of the main study reported in this thesis.

These university committees and the BPS provide researchers with detailed and well thought-out ethical guidelines. However, online ethics is a fast-developing area and Section 3.6 therefore details specific ethical concerns that were taken into consideration in the design of this research. This discussion of ethics is located in terms of the data corpus and of the university course from which it was taken, which are described in Section 3.5.

3.5 Pilot study: data corpus

A wholly online, intermediate-level psychology course at the UK-based Open University was selected for the original study by EDRU researchers because it offered an opportunity to explore the factors that support and hinder effective collaborative learning in an asynchronous electronic conferencing environment. The same data was relevant to this pilot study as it offered the opportunity to investigate learners interacting with each other and with their tutors asynchronously over a period of several weeks.

The Open University, where the course was based, is a distance-learning institution with considerable expertise in online methods. The selected course, referred to here as DZX999, has been offered since 2002, recruiting several hundred students each year and providing them with experience of research methods, training in research design, and practical experience of quantitative and qualitative analysis. It remains a compulsory part of the Open University's BA (hons) and BSc (hons) in Psychology.

The British Psychological Society (BPS) accredits this programme of study. The learning outcomes of the course are therefore focused on the requirements of the QAA Subject Benchmark Statement for Psychology (QAA, 2007) and on the coverage that psychology programmes accredited by the BPS are expected to demonstrate (BPS, 2008). Students are required to 'work with others to carry out the stages of drafting research proposals, data collection, analysis and interpretation' (Nettle, Pike, LeVoi, Brace, & Miell, 2006).

Students initially work online in a FirstClass conference (www.firstclass.com) alongside the hundreds of others on the course. However, the course website states that 'the principal part of the course involves designing, conducting and analysing a psychological study in small groups'. Students are therefore divided into project groups based on expressed topic preferences. The course presentation analysed in the main study contained 110 of these

project groups. Members could have encountered the other 3-7 students in their group before but, with student numbers so high on the course, this was not necessarily the case.

Each group was assigned two tutors, and most of these tutor pairs supported several project groups. In addition, a 'floating tutor' temporarily replaced any tutor who was unavoidably absent. Each project group was allocated a private conference area in FirstClass. Individuals still had access to larger conference areas within the FirstClass environment but, during this main stage of the course, it was expected that all interaction related to the group project would take place in the group's private area. Learners therefore had limited access to the experience of the many other groups on the course as only tutors had access to other project group conferences. These closed groups were intended to provide students with private space in which they could work on ideas together without feeling that they were overlooked or judged by others on their course. Groups' interactions were primarily asynchronous, but learners occasionally made use of the option to act synchronously by using the software's 'livechat' facility.

In their project groups and with the support of their tutors, the students worked together online for six weeks in order to develop and carry out an in-depth psychology study which they later wrote up individually and on which they were then assessed. Passing the course had career implications for students as it, or an equivalent course, is one of the elements required in order to achieve Graduate Basis for Registration, which the BPS describes as 'the first step towards becoming a Chartered Psychologist' (BPS, 2008, p4).

Students did not necessarily select this course because they preferred online study; many did so because they did not have the time or resources to access the alternative, an intensive residential school. Although personal data on individual students was not available, course statistics prepared by the Open University's Survey Office showed that, in the case of the groups included in the pilot study, all of the 557 students who registered

in the cohort had studied other courses at the Open University, 15% were based outside the UK and 82% were female. Approximately half already had qualifications higher than A-level, and 90% were working towards an undergraduate degree.

Evidence from the data later collected for the main study suggested that around 80% of students on the course had little or no previous experience of working with others in an online group. However, the learning outcomes of the course could not take this limited experience of the context into account because they, like those of the equivalent face-to-face course, were focused on QAA and BPS requirements.

FirstClass conferencing software was used to provide tutor support and a forum for group discussions and activities. This software supported asynchronous threaded discussions, synchronous text messaging, personal mailboxes, file upload and download. Interaction with other project group members was carried out in asynchronous conference forums or, more rarely, through synchronous 'live chat'. The following section discusses the ethical issues involved in the study of these types of data.

3.6 Ethics

Many published studies of online conferences make no reference to the ethics of choosing and accessing their dataset. Mehanna (2004), for example, studied the interactions of 200 students and 14 tutors, analyzing five million words, but her account of her research does not mention how she gained access to this data or whether students and tutors were aware of her study. Researchers may omit this information because it is taken as read that they are aware of and adhere to the norms of ethical research, because they are constrained by space, or simply because they have other priorities. However, omitting any discussion of ethics can mean that researchers appear to be treating online conferences as public areas, where data is unproblematically available to all who have access to the space.

The ethics of Internet research have developed rapidly. In the 1990s, three widely reported cases focused attention on the subject, highlighting aspects of the complex interplay between actions in the online and the offline worlds. The first of these cases was Julian Dibbell's (1993) account in 'Village Voice' of a rape in cyberspace and its repercussions. This was followed by Marty Rimm's report on Cyberporn, an ethically flawed undergraduate study of pornography on the Internet, which gained notoriety when it became a 'Time' magazine cover story (Elmer-Dewitt, 1995).

More directly relevant to academic researchers was Reid's study of JennyMUSH (1996), an online group for survivors of sexual abuse. Despite a careful and considered ethical approach, the publicity generated by the study was instrumental in provoking a crisis within this group. Considered together, these notorious cases made it clear that previously developed ethical guidelines were not necessarily adequate to deal with the complexities of online research and needed to be extended to deal with new situations (Sheehy, Ferguson, & Clough, 2007; Sheehy, Nind, Rix, & Simmons, 2004), that ethical concerns varied from case to case, and that unethical online behaviour could have serious consequences both for those studied and for the researchers themselves.

Researchers who conceptualized the online environment as a series of virtual communities peopled by individuals thus became aware that actions in the virtual world, even if wholly text based, are capable of harming individuals. Discussion of Internet research ethics in this context focuses on the human subjects research model, commonly followed in the social sciences, which regards the human subject's rights as primary and the researcher's aims as secondary (Waskull & Douglass, 1996).

The online environment was conceptualized in a different way by Jones (1997). He distinguished between virtual communities and virtual settlements, teasing out the distinction between a virtual community's messages and the community itself. Bassett and

O'Riordan showed that, when the Internet is characterized as a cyber-settlement containing texts and artefacts, ethical discussion following the humanities model is appropriate, focusing on issues of copyright, attribution and data protection (Bassett & O'Riordan, 2001). This ethical model requires researchers to identify and locate sources, whereas social scientists are required to protect privacy and confidentiality. Researchers must choose between conflicting ethical models, and this choice depends on their conceptualization of the online environment.

Another concern for researchers is whether material can legitimately be analysed. Waskul and Douglass (1996) demonstrated that online interaction is neither public nor private, but a combination of both. The distinction between 'public' and 'private' material is often taken to relate to accessibility, rather than to the experience of participants. Material that is in the public domain because it is accessible via a search engine, for example, may be considered private not only by its producers but also by those who respond to it.

In the pilot study and the main study described in this thesis, asynchronous course conferences were understood to be discrete online groups of students, rather than collections of text. While hackers could theoretically have visited these groups, as they could any online community, the majority of participants in the conferences that were studied entered via a series of induction procedures and with the help of certain gatekeepers. They were members of an institution, they were enrolled for or working on a specific course, they had the appropriate equipment, had been provided with the appropriate software and had, or were developing, the skills to use it.

This was clearly not material intended for public consumption – it was demonstrably private because it was password protected and accessible by only a limited group of people. Thus there were physical and social limits on membership and clearly delineated boundaries. This understanding of the conference necessitated the use of human subject

research ethics. The research design therefore required the informed consent of all participants, even when both the conference moderator and course chair had given permission for the study to take place and even though the researcher had temporary staff access to the conferences in the capacity of academic assistant for several weeks.

This need for informed consent limited the data corpus available for study. While it is theoretically possible to remove from a conference transcript any data relating to people who have not given consent, this is likely to damage the remaining transcript. In many cases this can result in an entire thread being rendered indecipherable and the history of a group appearing 'moth-eaten' (Rheingold, 2000, p22). Deleting one participant's postings is also difficult, because participants often include direct quotes from others or, by selecting 'Reply', append entire messages or message threads to their own text. As the study of such strategies was of direct relevance to the research, it was vital that all members of a project group, both staff and student, gave their informed consent to participation in the study before any conference was either accessed or archived.

For these reasons, individual project group conferences were selected for study by the researchers who collected the data used in the pilot study. As anonymity, confidentiality and privacy in online environments are concerns in online contexts (Joinson, 2003), participants were given assurances regarding these matters. All research data was, and is, stored securely on a password-protected computer. All participants were contacted in writing to brief them on the research and to request informed consent. Conferences were only selected for study if all participants, staff and students, explicitly gave their consent.

3.7 Pilot study: preparing data for analysis

Preparation of the data for analysis was an important element of the pilot study because it allowed the implications of each decision to be considered. A result of this was that data preparation for the main study was significantly different (see Section 4.4 below).

In order to analyse a wide range of student experience, data from two contrasting project groups were studied during the pilot. The two groups are referred to here by the pseudonyms Turquoise and Mauve. The Turquoise project group was one of the smaller groups on the course, consisting of five students who carried out research into memory, using quantitative methods of data analysis and supported by two tutors. The Mauve project group was one of the larger groups, containing eight students. This group focused on the other main theme of the course, the psychology of communication. In contrast to the Turquoise group, Mauve used qualitative methods of data analysis. Communication within each group was mediated by computer technology.

The message bodies of all postings in the Mauve and Turquoise conferences were archived as Word documents by the researchers who originally collected the data. When archived, the Mauve conference contained 34,000 words posted by eight students and two tutors, while Turquoise contained 40,000 words posted by five students and two tutors, with another 50,000 words available because one student accidentally appended the same long form numerous times. Mauve conference contained 242 postings, of which 64 were from tutors. Turquoise conference contained 284 postings and tutors contributed 53 of these.

For the pilot study, in order to limit research to individual students' own words, some parts of the archived postings were deleted. Elements of the message heading that were filled in automatically by the software were removed. These were the name of the course, the year and month in which the course had started, and the name of the conference group. Files, mainly completed forms that had been appended to conference postings, were also removed and notes added to indicate where this had been done. In some cases, students had experienced technical problems when posting and had posted the same form or message several times in a row. Duplicate messages were removed.

Quotations from other conference participants were also removed. In many cases these quotations were the result of participants selecting the 'Reply' option and therefore including one or more previous messages automatically at the foot of their own. Some participants consistently used the 'Reply' button rather than the 'New message' option, and the quoted postings were not necessarily relevant to their message. All quotes from other participants were removed, even when they were embedded within a posting. Doing this limited each message to the words produced by its author. This approach was adopted both for reasons of consistency and because an initial reading of embedded quotes suggested they were not, in these conferences, useful indicators of approaches to study.

Messages in an asynchronous conference are not necessarily read chronologically – readers are more likely to follow threaded conversations. Word processing software is less flexible in this respect. Once files are arranged by thread, by chronology, by reverse chronology or by poster it is difficult to change this order. While developing the coding system, postings were arranged alphabetically by poster. This had the advantage that the coding of individuals' approaches to study could be identified at a glance, and that any change over time could also be seen. However, it was considered that this would increase the subjectivity of coders' judgements if they made an early decision about individuals' approach to learning and then coded consistently rather than accurately. For this reason, the researcher presented postings in the pilot study as chronologically ordered units so that coders could make sense of them while coding consistently.

Prepared data from the two conferences were analysed according to the coding scheme (Appendix A) by the researcher and a colleague. The researcher and a colleague first applied the coding scheme to the Turquoise conference. Both coders were required to code the conference data twice, and to produce a final coding after comparing those results. Discussion between the two coders produced a more fine-grained analysis, and disagreements between the two appeared to be a result of the complexity of the work rather

than of disagreements about the application of the coding. After coding the Turquoise conference, in which the mainly task-related discussion was focused on a quantitative experiment, the coding protocol was applied to the first 50 postings from the Mauve conference. In these postings, participants talked about themselves and their lives as well as the qualitative analysis of video data. Before coding this data, the two coders worked on small samples of Mauve postings and discussed their interpretation of the codes. They then moved on to work on the first section of the Mauve data, 53 posts. However, despite this preparation, inter-rater agreement proved to be unacceptably low, with the two coders agreeing on only 58% of the codes assigned. There were three main reasons for this. First, the coding scheme was complex because it dealt with different aspects of deep, strategic and surface approaches to study. This led to mistakes and misinterpretation. Second, coding varied according to the coder's interpretation of the type of knowledge being constructed at any point. Third, the importance of context, and particularly of temporality, became increasingly clear, but these dimensions were not covered by the coding scheme. These three issues are clarified and considered below.

3.8 Pilot study: findings

The pilot study used the conference posting as the unit of analysis. This had the advantages of being objectively identifiable and of producing a manageable set of cases. It was also a unit with parameters determined by the author, rather than by the coder (Garrison & Anderson, 2003). However, a posting could be hundreds of words long, dealing with several different themes. In addition, talk is dynamic and has different meanings at different times (Mercer, 2004). To code each unit only once would have privileged only one interpretation of each posting. For these reasons, no limit was set on the number of ways in which each unit could be coded. Most units contained one to three themes. Around 6% of student postings – usually brief acknowledgments – remained 'Unclassified'.

Although multiple coding can support the production of a fine-grained qualitative analysis, it can be expected to limit the reliability of quantitative content analysis. Raters have to agree not only on the codes they assign, but also on the number of codes they assign. In addition, multiple coding cannot be aligned with the set of mutually exclusive and jointly exhaustive categories that is a fundamental requirement of content analysis (Pidgeon, 1996). This study encountered problems previously described by Mercer and Wegerif (1999): utterances often served multiple functions, were ambiguous in meaning, and their meanings did not remain constant, but were renegotiated over time. Raters therefore struggled to apply the coding scheme consistently.

A change in the unit of analysis would not have been a satisfactory solution to this problem. Postings, sections of postings and sentences often dealt with two or more issues. Shorter grammatical units, such as the clause or the phrase, could not be reliably identified due to the variability of grammar and punctuation in online dialogue. The difficulty of selecting a unit of analysis to which individual codes could be applied suggested that content analysis was not an appropriate method of approaching this type of data. Further difficulties were identified during the process of analysis.

When analysis began, it appeared that the researchers who gathered the data had archived Mauve and Turquoise project group conferences in their entirety and that the data preparation procedure had focused attention on the input of individual participants. Detailed analysis showed that the data were, in fact, far from complete. Many postings were difficult to interpret without access to documents originally attached to the postings or to contextual information about their arrangement and presentation within the conference. The researchers who assembled the data corpus had chosen to omit these elements, so they were not available for study. Another problem was that the study of conference postings biased the study by over-representing strategic approaches to study.

The organizational requirements of the conference environment promoted a strategic approach in several ways. To post to the conference at all was a strategic manoeuvre. A student whose approach to study in this context was entirely deep could conceivably have read all the postings with interest, discussed them with friends and colleagues and built upon them, but in order to pass the course they needed to meet the basic strategic criterion of being seen to participate in the conference.

Students were required to work together online and to complete certain tasks together at certain times, and therefore needed both to organise their time and to demonstrate to other students that they were doing this. The conference data showed students continually reporting what they were doing, what they intended to do next and when they were going to be online. The text-based medium also evidenced the minutiae of meeting the assessment requirements, showing evidence of the students reviewing proposals, making decisions and signing off submissions. Sixty-five of Mauve group's postings – a third of the total student postings – included these types of strategic work, as did a quarter of those posted by Turquoise group. The resultant emphasis in conference postings on a strategic approach to study indicated that an archived set of conference postings alone was not a reliable guide to the actions and motivations of students. A wider set of data was required, and the pilot study indicated what this dataset should include.

Students in the project group had access to common resources, in the form of course materials. Without access to these resources, it was difficult to make sense of some elements of the dialogue and to understand the terminology used. Mauve group spent several days discussing the potential of different video clips to be used as data for the group's research project. With shared access to these clips, they could refer to them in abbreviated ways, for example, 'I am leaning towards clip 7', 'the doctors in the medical clip' and 'the majority of us are leaning towards option 4 and 7'. For the researcher without access to these resources it was not always possible to tell whether students were

developing a sustained dialogue about one piece of data or whether they were contributing unrelated comments about a variety of data clips.

A similar problem resulted from the absence of the resources created by the groups, which they shared by means of documents attached to the postings. These resources were not archived for research purposes, and the literature suggests that this is common practice. - 117 -Even ethnographic studies make little or no reference to attached documents. However, they are important for an understanding of the dialogue in the conference. When one student posted, 'Please find attached my analysis', her posting met the coding criterion 'Seeks to develop project in line with assessment criteria / practical concerns' and was therefore coded as evidence of a strategic approach to learning. If the attached analysis had been available and considered to be part of the continuing dialogue, it is likely that the coding would have been different. Similarly, the posting 'I have just had a look at what [another student] has done on the second half, and it looks really good to me' was coded as evidence of a surface approach to learning because it met the criterion 'Responses to students' data or input unsupported', but this coding could have changed with access to an annotated attachment.

Also absent from the data were some contextual elements. In part, this problem was due to the use of a previously collected dataset, but it was also related to technical problems and to a lack of awareness of the importance of these elements. When the data corpus was assembled, Turquoise conference postings were preserved together with the data and time at which they had been created. Mauve postings, on the other hand, were preserved together with the data and time at which they had been archived. This was not necessarily a problem; the postings were archived chronologically, dates and times of postings were not automatically relevant. However, the group frequently reported technical problems: 'a lot of messages have been going astray recently and then re-appearing in random order! Bit of a nightmare!' This random arrangement of the dialogue created confusion for students and

researcher alike. Once again, it was not always possible to tell whether students were developing a sustained dialogue or whether they were contributing unrelated comments.

This highlighted the importance of formatting for the analysis. The transfer of computerised data from one medium to another often results in a lack of formatting, as the words are preserved but their size, colour, font and layout are lost. In addition, the formatting of FirstClass postings is not fixed because text appears differently if viewed via the Internet or via software installed on individual computers, and also varies according to the reader's software preferences and available hardware. These considerations led to all postings being archived in 10pt Courier, single-spaced and justified. As a result, dialogue that relied upon formatting for clarity became difficult to interpret, as in this example from Mauve: 'Please find attached annoted manuscript-are we expected to modify speech etc., according to West's hieroglyphics?!-bit daunting!'

This posting could be interpreted as one turn in the conversation and, as such, would be coded as evidence of a deep approach to learning because the author 'initiates ideas that relate to understanding'. Equally, the exclamation 'bit daunting', could be the only new input by the student, if the other text was the quoted input of one or two other students. In that case, the student's input would be coded as evidence of a surface approach because it was restricted to an expression of 'concern about work'. Different contributions within the posting may originally have been differentiated by the use of colour, bold, italic, size or font. The unusual use of hyphens suggests that this posting may have combined the input of two or three people but, without access to the chronology of the discussion, or to the original formatting, the input of the posting author remains unclear. The coding process thus made it clear that words were not the only channel of communication used within the conference and that formatting also contributed to meaning.

A final contextual problem was the decision to remove quoted material and thus confine analysis to the contributions of one author per posting. This appeared to have the advantages that the same text would not be coded many times, and that the input of individual students could be classified separately. However, as is clear from the example above, it was not always possible to distinguish between original material and quotations.

When it was possible to distinguish and remove quoted sections, new contributions sometimes became difficult to understand and to code. For example, the word 'Good' on its own carries little meaning, but when contextualised by a quote its role in the dialogue becomes clearer, as this example shows.

> >>To make a fair analysis this would then be re-analysed by some one else in the group...so effectively we end up analysing two separate sequences and agreeing on final versions.<<GOOD'

The pilot study thus indicated the need for a method of analysis that could deal with the use of quotations, without overemphasising their importance by repeatedly analysing identical data. It also showed that individual contributions to group learning could not easily be distinguished because knowledge was co-constructed by the group, with the input of individuals only comprehensible or valuable in terms of other turns in the dialogue.

3.8.1 Knowledge construction

Problems with the application of the coding scheme and the selection and presentation of data therefore limited the reliability of the research. The selection and presentation of data also limited the validity of the analysis, because the removal of formatting made it difficult to interpret the postings. Another concern was variation in the coding dependent on the coder's interpretation of the type of knowledge being constructed. An original, underlying assumption of the research was that knowledge construction was task based, and that social and organisational work formed part of the context of the construction process. Data analysis showed that this was not the case. Students were engaged in the construction of

task-focused, social and tool-focused/organisational knowledge, and therefore a coder's interpretation of the knowledge they were constructing influenced how the dialogue was coded. Although the archived conferences provided detailed evidence of learners' interactions, they provided only limited evidence of the reasons for and the thinking behind participants' actions.

The activity of one student serves to illustrate that a valid assessment of students' approach to study cannot be made without an awareness of what they are trying to achieve. Kelly (all names of participants are pseudonyms) was a member of the Turquoise group. As the group's first deadline approached, she went through what she later described as 'my near nervous breakdown'. Several consecutive postings contributed by her were coded as evidence of a surface approach to study because they met the criterion: 'Expresses concern about work, marks or deadlines / struggles / needs reassurance.' For example, a long posting late on the evening before the group's first deadline read, in part:

> I am very anxious and very frustrated. I don't feel as if we are getting anywhere…. I am very close to breaking point as I know that this proposal is not going to be ready by Thursday evening.

In terms of the study of psychology and memory to which the conference was explicitly oriented, Kelly appeared to have adopted a surface approach. Her panicky messages demonstrated no interest in the meaning of her studies. In terms of learning how to organise work in online groups, though, the postings can be interpreted as strategic, because they prompted other students to calm her down by working to meet the assessment criteria. If this persuasive work was conscious, it could even be viewed as evidence of a deep approach to social learning; of an awareness that the meaning of her action was that other students would have to choose between taking on her share of the work and failure.

These subtle distinctions served to emphasise that several types of knowledge are being constructed within an online group of learners at the same time: task-focused, tool-focused

and social. Studying the construction of just one type is difficult and of limited value, because the different forms are so closely interwoven. Communication that appears to be off-task or of little value when viewed from the point of view of a course's learning objectives may be essential to developing methods of collaborating in the online environment or to building a sense of mutuality and confidence amongst learners.

3.8.2 Temporal context

The pilot study also pointed to the importance of temporal context when learners are working online in groups. It suggested that temporal concerns were associated with the co-construction of social knowledge and also with the construction of knowledge about how to organise as an online group.

Half the students in Mauve Group were explicit about limitations on their time. Their study patterns had to be fitted around different shift work arrangements, child-care responsibilities and a student who was working in another time zone. Turquoise group had more regular study patterns, but had to accommodate a student who arrived on the course a week late, and another who had to spend time in hospital. The extended nature of the course, with project group conferences active for six weeks, meant that learners had to structure their work around pre-existing commitments that took them away from the computer, including holidays, festival preparation and business trips.

In order to develop their research project as a group, students had to negotiate ways of working together and build up social knowledge about the availability and reliability of fellow group members. Chat about families, holidays and lifestyles had the serious purpose of keeping group members informed about which individuals would be available when. Both students and staff flagged up times when they would not be available and often provided details of planned work schedules. In some cases these postings were linked to self-disclosure that helped to build social relations and confidence within the group.

3.9 Significance of the pilot study

Although the combination of 'approaches to study' and content analysis helped to inform the methodology of the main study, it did not provide reliable and valid answers to the research question of the pilot study. The pilot study methodology has been described here, in order to facilitate understanding of the implications of the study, but this description has been brief because neither content analysis nor the 'approaches to study framework' was employed in the main study.

The pilot study made a valuable contribution to the main study in terms of both methodology and focus. Content analysis was shown to be an inappropriate method for a study focused on cognitive, social and organisational knowledge rather than on just one of these. This accords with Mercer's (2008) view that coding schemes in which similar utterances are taken to have the same value, regardless of their location in the sequence of communication, are inappropriate. The nature of the data prevented reliable identification of a suitable unit of analysis based on structure, grammar or meaning. In addition, a lack of contextual information made interpretation of the data difficult, particularly as this interpretation was not triangulated with learners' accounts of their activity. A further problem was that the approaches to study framework focused on, and separated out, the activity of individual group members and was therefore not well aligned with a sociocultural study of the situated interactions of a group and of the co-construction of knowledge as a social achievement.

A data set consisting only of conference postings was shown to bias and limit interpretation of the data. It was clear that data preparation should also include the preservation of attached documents, contextual cues, formatting and quotations and that the type of analysis selected for the main study should be capable of taking all these elements into account.

In terms of the focus of the main study, the pilot showed that organisational and relational work by groups of learners should not be regarded as merely part of the context of the co-construction of knowledge. The process of learning involves complex social activity, with learners involved in task-focused, skills-focused and social learning, and all of these should be considered as important forms of knowledge construction.

The pilot also drew attention to the temporal context of online learning. Learners encountered problems making sense of their interaction when conversations extended over days, were interrupted and interleaved by other conversations and were experienced in different orders by different contributors. The asynchronous nature of their dialogue meant that group members had to negotiate ways of working together, and that they also had to develop ways of sharing social knowledge.

Chapter 4 goes on to describe the methodology of the main study, showing how this was influenced by the pilot study. The chapter describes the data set used, and how this data was prepared for analysis. The pilot study focused on activity that was visible to all conference members but although the archived conferences provided detailed evidence of learners' interactions, they provided only limited evidence of the reasons for and the thinking behind participants' actions. The main study extended the data set by carrying out interviews to reveal aspects of learners' interactions that they had not expressed to the group. This interview data was also intended to add credibility to the research by including learners' accounts of their online activity as well as the researcher's interpretation of that activity. Asynchronous textual interviews were therefore carried out to extend and inform interpretation of the conference data, and this relatively new method of data collection, known as epistolary interviewing, is described in detail in the next chapter.

4 Methodology: main study

As a result of the pilot, data collection and preparation were developed and extended and new methods were used. The data collected for the main study included the full text and formatting of conference postings together with all attached documents. In addition, epistolary interviews were carried out in order both to add to the reliability of the analysis and to inform it by extending it beyond the material available in the conferences. Content analysis was replaced with thematic analysis, sociocultural discourse analysis and visual analysis. These methods were selected because they were more suitable for the research questions, the data and the sociocultural perspective. The account of the main study begins with a consideration of data collection and how this was influenced by the pilot study.

4.1 Main study: data collection

FirstClass conferences from the Open University psychology course referred to here as DZX999 were selected for study, as in the pilot, but the project groups archived in this case were from the 2006-7 presentation of the course, rather than the 2004-5 presentation from which the pilot data was collected. This supported triangulation of data from different groups and different course presentations. Three conferences were archived in their entirety. Participation in each conference was restricted to members of a single project group working on DZX999, together with the staff members working with those groups.

The DZX999 course was described in detail in Section 3.5. It is a distance-learning course that recruits several hundred students each year and provides them with experience of

research methods. Students do not necessarily select this three-month online course because they prefer online study; many do so because they did not have the time or resources to access the alternative, a course with the same syllabus that is studied at a week-long residential school. Students who wish to gain The Open University's BA (hons) or BSc (hons) in Psychology are required to pass either DZX999 or its residential-school equivalent. The British Psychological Society accredits both these courses. Their learning outcomes are therefore identical, and are focused on the coverage that psychology programmes accredited by the BPS are expected to demonstrate (BPS, 2008).

Unlike other universities, those at The Open University cannot be defined according to their year of study. Students with doctorates may enrol for entry-level courses in other disciplines, while students with few qualifications may attempt relatively advanced courses. However, course statistics prepared by the university's Survey Office provide detailed information about those enrolled for DZX999. These statistics showed that all the 695 students who registered in the 2006-7 cohort had studied other courses at the Open University, 12% were based outside the UK and 81% were female. As had been the case with the cohort studied in the pilot, approximately half the students had qualifications higher than A-level, and 88% were working towards an undergraduate degree.

The ethics of both the pilot and the main study were discussed in detail in Section 3.6. In the case of the main study, all students and tutors on the course were contacted in writing to brief them on the research and to request informed consent. The only exceptions were individuals previously identified by the university as not available to take part in research. Those contacted were asked whether their conference data could be archived and also whether they could be interviewed. Not everyone who agreed to the archiving also agreed to be interviewed. Conferences were only selected for study if all participants, both staff and students, explicitly gave their consent for archiving to take place. This was the case with three of the 110 project group conferences, which thus formed a self-selecting sample.

Consent was gained and conferences were archived after the course had finished in order to demonstrate to students that the study would have no impact on assessment and to demonstrate to staff that their performance was not being monitored. Contacting potential participants once the course was over meant the conference data was not the product of participants who were aware that their interaction would be studied. As anonymity, confidentiality and privacy in online environments are concerns in online contexts (Joinson, 2003), participants were given assurances regarding these matters. As with the pilot study, research data was stored securely on a password-protected computer.

The data archived for the main study was much more comprehensive than that collected for the pilot. It included the text and title of all messages posted in the conference, together with the names of their authors, the dates and times when they were posted, any documents or icons attached, screen captures of all the messages (in order to preserve visual elements), and the history of each posting showing who it had been read by, who had downloaded its attachments and when they had done this, and the first time and date each individual had read it. The postings were the main elements of asynchronous dialogue in these conferences, but they also contained summaries or logs of live chat, occasional references to personal emails or conversations with people outside the group, attached documents, and attached documents with Word's 'track changes' facility enabled. Transcripts of synchronous live chat were not typically available and were only archived when they had been pasted into or attached to an asynchronous posting.

All this data was archived and stored securely on a password-protected computer in several forms. Images of conference postings were stored. In addition, their text was stored in tabular form so that the order of the postings was not permanently fixed and they could be arranged by subject, author and chronology as would be possible in a FirstClass conference. In addition, the DZX999 course team allowed the researcher access to the three course conferences once they were no longer in use by staff or students. Data could

therefore be observed in its original context without the changes that are inevitable when data is transferred from one medium to another.

The Open University, the course and the project group conferences were described in detail in Chapter 3. This section therefore focuses on the three project groups archived for the main study. These project groups are referred to by the pseudonyms Jet, Pearl and Sapphire. All names of staff and students are also pseudonyms, as is the name of the course. The composition of the three groups is outlined in Tables 1, 2 and 3. Each group included between four and seven students and one or two tutors. In addition, a 'floating' tutor covered for scheduled staff absences. All three groups shared the same floating tutor, although his input was limited and usually consisted of no more than an introductory message. Senior tutor Owen, who had responsibility for overseeing work in around 30 project group conferences, also posted once in Jet conference.

Pearl and Jet groups were comparable because the groups had the same tutors, both researched the psychology of communication, both decided to use qualitative analysis, and both analysed video data. By contrast, Sapphire group had a different tutor, and group members developed a quantitative research study based on the psychology of memory. Sapphire group was unusual in that it had only one full-time tutor assigned to it, and that tutor's job was particularly challenging because he had to deal single-handed with a conference that was open 24 hours a day, seven days a week for six weeks.

All students and tutors in these groups were asked if they would agree to be interviewed. Three students and two tutors agreed. These were Maggie (Jet student), Olivia (Jet student), Teresa (Sapphire student), Joanna (Pearl and Jet tutor) and Philip (Sapphire tutor). These individuals are indicated by the use of italics in Tables 1-3. As Joanna and Zoë tutored two of the archived conferences they appear twice in the tables.

Project group: Pearl			
Name	**Role**	**Postings**	**Attachments**
Andrea	Student	26	5
Joanna	*Tutor*	*78*	*5*
Ron	Floating tutor	1	0
Ethan	Student	37	18
Rita	Student	73	8
Charlene	Student	72	11
Zoë	Tutor	13	0
	Total	**300**	**47**

Table 1: Pearl conference postings were written between 10 November and 6 January. Individuals who were later interviewed appear in italics.

Project group: Jet			
Name	**Role**	**Postings**	**Attachments**
Joanna	*Tutor*	*65*	*2*
Ron	Floating tutor	1	0
Eileen	Student	120	21
Glenn	Student	68	9
Hannah	Student	110	8
Heather	Student	26	3
Maggie	*Student*	*52*	*7*
Olivia	*Student*	*75*	*6*
Owen	Senior tutor	1	0
Kenny	Student	77	8
Zoë	Tutor	23	1
	Total	**619**	**65**

Table 2: Jet conference postings were written between 10 November and 22 December. Individuals who were later interviewed appear in italics.

Project group: Sapphire			
Name	**Role**	**Postings**	**Attachments**
Amy	Student	17	4
Ron	Floating tutor	3	0
Georgia	Student	22	3
Philip	*Tutor*	*64*	*3*
Ryan	Student	38	7
Tamara	Student	22	9
Teresa	*Student*	*30*	*8*
	Total	**196**	**34**

Table 3: Sapphire conference postings were written between 10 November and 22 December.

Individuals who were later interviewed appear in italics.

The tables also show how many postings were contributed by members of each conference, and the number of documents that each group member appended to their conference postings. These figures are included to indicate the relative size of the three conferences, and to demonstrate that all students contributed attached documents as well as postings.

4.2 Data collection: interviews

The data corpus included virtually all the interaction between the members of three project groups – from the time they first met and began to work together, to the time they completed their final piece of joint work six weeks later. Only synchronous interactions were inaccessible. However, the online discussion suggested that synchronous encounters were rare, and that most of these interactions using the FirstClass Livechat facility were summarised in conference postings for the benefit of those who had not participated.

The archived conferences provided detailed evidence of the ways in which tutors and learners used asynchronous dialogue, but provided only limited evidence of the reasons for and the thinking behind participants' actions. Postings revealed the public face of

conference activity, while masking private opinions and reflections. The archived records of online interactions were therefore supplemented by a series of interviews intended to reveal unexpressed aspects of learners' interaction, particularly the feelings and reactions of group members; to provide different perspectives on that interaction, and thus to enrich understanding of the effects of different factors on learning (Zhu, 2006).

The interview data was used to extend understanding, both to other groups and to other time periods. It allowed analysis to take into account groups working on the course at the same time as Sapphire, Jet and Pearl, and the experiences of individuals after they had completed their group work. In addition, because most of the tutors interviewed had worked on the course in the past, and one student interviewed was retaking it; the interviews allowed the extension of analysis to the experiences of groups in other years.

In the case of the archived conferences, all participants who gave their consent to an interview were interviewed. The majority of other students and tutors who were interviewed were selected on the basis that there was at the time a strong possibility of gaining consent to access the project group conferences in which they had participated.

In addition, members of Gold group were interviewed because this was the only group in which all student members consented to be interviewed, thus providing a more complete picture of student interaction than was possible with other interviews. Altogether, 21 project group members were interviewed, including eleven students and three staff from the project group conferences to which no access was available because not all group members had given their consent. Student interviewees were drawn from nine project groups, and the tutors reported that, between them, they had worked with 14 project groups in the 2006 course presentation, as well as many others in previous years. Interview data therefore included responses from 23 of the 110 project groups formed in 2006.

4.3 Epistolary interviews

Epistolary interviews, first described by Debenham (2001), were selected for use. These are asynchronous, one-to-one interviews that are mediated by technology. The interviews involved ten questions that were emailed separately. Responses came in the form both of emails and of documents attached to those emails. The interview questions that were presented to students form Appendix B, and the interview questions presented to tutors form Appendix C. These questions, and the use of the method in this study, were trialled on two students with experience of online group learning and on a staff member who had worked on DZX999. Their responses were considered as pilot data, and were not incorporated within the main study.

The interview questions focused on the experience of working together online, in order to investigate the social and organisational aspects of group work. They were considered both as a source of witness accounts of the social world, and also as an indirect source of evidence about interviewees' perspectives (Hammersley, 2003). The intention was to identify themes that were frequently raised by students and staff but that were not immediately apparent in the conference data. An additional aim was to secure an in-depth understanding of knowledge construction within the conferences by triangulating data obtained by different research methods (Denzin & Lincoln, 2003).

Epistolary interviewing was selected rather than face-to-face interviewing because the people to be interviewed were widely distributed both within the UK and across Europe, so meetings would have been difficult to arrange, time consuming and expensive. The interviews could have been carried out by telephone, but epistolary interviewing was considered to have several advantages. The method allows both interviewer and respondent to select suitable interview times, provides time to consider questions and responses and eliminates the need for transcription. It has the potential to produce rich data because it

produces thoughtful exchanges in which both interviewer and respondent have opportunities to consider, clarify and expand their meaning.

The epistolary nature of such interviews means that, as in a sequence of written letters, a relationship between the correspondents can be established and developed over time (Kivits, 2002). Joinson (2001) reports 'there is considerable evidence that within a research setting, people… disclose more about themselves online compared to in offline equivalents, and that much of that disclosure is more candid' (p25). The method allows a researcher to conduct several interviews simultaneously, so data from one interview can be tested in or used to develop other interviews. In this case, the asynchronous mediated nature of the interview reflected the subject matter, and it seemed likely that this would trigger reflexive analysis in some cases.

As interviewer and respondent do not need to be co-present in time, respondents are empowered by being able to choose when to respond, rather than having to produce the immediate responses expected in a face-to-face or telephone interview. The asynchronous nature of the interview also means that respondents have time to consider their answers and that they can, if they choose, make reference to supporting materials or references rather than produce responses which are not thought through (Wang & Woo, 2007).

The method has some disadvantages. The need for computer skills and access could produce a biased sample, but all Open University students are required to have email access and the focus of this research was on students and tutors known to have participated in an online course. Some researchers have reported technical problems, for example Bampton and Cowton (2002) reported that interview data was lost when their university's system failed and data had not been backed up. However, the Open University computer system used by the researcher is robust and regularly backed up. The method reduces spontaneity, which is compensated for by carefully considered communication from the

interviewer. The method does not aim for neutrality, but builds a relationship between researcher and respondent that is intended to support interpretation of the data. This lack of neutrality was not felt to be a problem because the focus was on collecting rich qualitative data. However, the main questions contained in Appendices A and B were worded in the same way each time they were presented, in order to give consistency to the data.

The epistolary interview is a developing form that may use the conventions of face-to-face interviews, telephone interviews, email communication or a combination of these, depending on the situation. The interviewer therefore sets the pattern for the formality of the interview, ensuring that the online format is used to organise and facilitate talk rather than to constrain it. The length, aims and format of the interview, the need for spontaneous or researched responses, and whether reference can be made to external material such as attachments were therefore established at the outset and each email from the interviewer contained a link to a web page on which the interview format and structure were described in detail. Respondents were aware that they could provide either spontaneous or researched responses, that they could attach supplementary material to their answers and that they could end the interview at any time.

4.3.1 Ethics of epistolary interviewing

Researchers carrying out any form of computer-mediated interview must be aware that text has the potential to be used and misused as evidence. Textual communications may be preserved, de-contextualised, misused or passed on. Like a postcard, an email may be read by those involved in delivering it, by those who view it dishonestly or accidentally, by those who have access to its recipient's mailbox, by those who find it lying on a desktop and by those who find it in the dustbin.

As epistolary interviews can take days or weeks, the developing relationship between researcher and respondent may lead to interviewees reflecting in detail on personal issues.

This provides rich data but introduces ethical complications. 'Even when they are given clearly presented guidelines, it is unlikely that interviewees will have been in a similar situation before' (King, 1996, p177). This is particularly true in the case of epistolary interviews, which could become indistinguishable in the respondent's view from other online exchanges. Positioning is important, as roles are not necessarily clear and the interviewer may, consciously or unconsciously, be positioned as interviewer, friend, critic, correspondent or ally. 'Writing letters is a way of at least sharing oneself with another, and perhaps even creating a version of the self for that occasion' (Perry, 1980, p137). The epistolary form therefore requires conscious negotiation of identity roles on the part of the interviewer as a relationship is constructed, and it is important that informed consent is actively maintained during the interview (Sheehy, et al., 2007)

Epistolary interviews are automatically transcribed, and this transcription is available to both interviewer and interviewee. This empowers interviewees, who can be sure their words have not been transcribed wrongly or misquoted. However, quoting from epistolary interviews raises further ethical issues. Initially, it seems obvious that answers typed by interviewees should be quoted verbatim, giving direct access to the data. However, in many cases unusual spacing, multiple line breaks and changes of font and colour make such direct quotation difficult within an academic text unless the focus is on the significance of these aspects of the dialogue.

Many people write and send emails quickly and devote little thought to correct spelling, punctuation or proofreading (Baron, 1998). As in a spoken interview, there are hesitations, contradictions, mistakes and awkward pauses. These are, conventionally, tidied out of transcribed audio interviews (Halliday, 1985) unless conversation analysis is being employed (see, for example, Sacks, et al., 1974). Transcriptions of spoken interviews rarely include representations of accent or of hesitation, and transcripts that do this run the risk of misrepresenting interviewees as unintelligent or incoherent.

Researchers must therefore decide whether to follow the accepted academic editing convention of 'silent correction' (Huitfeldt & Sperberg-McQueen, 2008) when quoting epistolary interviews and standardise spacing, punctuation and spelling. For the purposes of this thesis, spacing, layout and typographical elements of both interview and conference data are presented conventionally, except where the focus of the analysis is on these aspects of the text, in which case these elements are reproduced in screen shots.

Where emails or conference postings are quoted in the text, spelling and punctuation have been 'tidied', to avoid tripping the reader with irrelevant mistypes and constant repetition of the word 'sic', and to avoid drawing undue attention to simple mistakes by preserving and highlighting them. When variations from standard spelling or grammar in quoted data are considered to have any relevance to the analysis they are preserved, often in a screen shot. For example, in a direct quote such as 'I still think it was a great idea and exiting stuff :))', the spelling of the word 'exciting' would be corrected unless, as here, it was relevant to the point being made. However, the atypical combination :)) would be retained because it appears to be an intended and relevant part of the sentence.

Readers may be surprised by the decision to correct minor errors of spelling and grammar, fearing that this will distort and misrepresent the data. However, most readers will have accepted without question the decision in the preceding paragraph to strip colour, size, font and spacing from short segments of data in order to present it conventionally in 12pt Times New Roman, double spaced to meet university requirements. In this thesis, the text and the layout are treated equally – they are preserved in their original form whenever that form is important to the analysis, and they are tidied if presentation in their original form would distract readers from the point being made. The majority of the data included within the thesis has not been transcribed, retyped or reformatted – it is presented in screenshots laid out as it would have appeared to learners in their project group conferences.

4.4 Main study: preparing text for analysis

In these images of the data, conference postings are displayed as they appeared on the researcher's screen. The images preserve colour, typeface and typographic elements of layout for analysis. Some elements of the message headers: heading, date and time, group name and author's name were automatically generated by the software. Posting authors created other message content. These authors either selected the default option and presented text in 10pt Arial black or chose to change these elements of their presentation.

In order to produce images of the conference data, FirstClass conferences were opened in the web browser. Default settings were not changed, and the researcher did not use the 'enhanced view' now available on the Web. The screen grab facility on the Apple Mac was used to take a PNG image of the message on the screen. In order to anonymise the PNG images before publication, they were opened in Adobe InDesign. Names of the course, the group and the individual were replaced with pseudonyms and personal details were anonymised. In all cases, care was taken to match the font, size, case and formatting of the original. A 0.5pt border was added to all conference postings, to mark them off clearly from body text. In the case of attached documents, screenshots were taken and, where appropriate, anonymised in the same way.

The form of technology-mediated communication is never entirely fixed, and its display is ordered according to the limitations of hardware and software, as well as the preferences selected by the reader. In conference postings, the ordering of the header and the line breaks varies according to participants' hardware and software settings but, in other respects, their view would not have been significantly different. In the case of attached documents, readers may choose to view 'invisible' characters such as spaces and line breaks. They may also view the wavy red underlining with which Microsoft Word indicates possible spelling mistakes, and the green wavy lines with which it indicates

possible grammatical errors. These elements have been included here when they are relevant to the analysis.

4.5 Data analysis

The description of the pilot study in Chapter 3 showed why content analysis could not be used to answer the main question of the thesis, 'How do groups of learners use asynchronous dialogue to build shared knowledge over time?' It also identified requirements of the data analysis. First and foremost, it was necessary for the method of analysis to be aligned with the sociocultural focus of the study, which views learning as a situated group accomplishment. Analysis therefore had to deal with a range of contextual factors and, in view of the research question, had to be capable of dealing with the co-construction of knowledge over different periods of time. It was also important that it should take the group as a whole, rather than the individual, as its unit of analysis.

The pilot study made it clear that accounts of the data needed to be rich, because the same element of the dialogue could perform several different functions and could therefore be interpreted in various ways. Together with the need to take context into account, this pointed to the need for a qualitative form of analysis that could deal with data over different periods of time. The analysis also needed to deal with a wide data set including conference postings, a range of attached documents, contextual information and interviews. It had to be flexible enough to deal with both dialogue and formatting and, importantly, it had to be capable of producing credible, transferable, dependable and confirmable results.

With such a complex series of requirements, no one form of analysis was found suitable to meet all of them. This accords with Mercer's finding (2008) that there is little guidance for those studying the temporal development of any type of talk. Methodological texts on

sociolinguistics, discursive psychology, conversation analysis and systemic functional linguistics do not deal in any detail with temporality.

This study therefore made use of three pre-existing forms of qualitative analysis. Sociocultural discourse analysis was used to study the dialogue in its context. Visual analysis was applied to elements of the communications such as typography and layout. Finally, thematic analysis allowed use of the interview data to inform study of the conference material. Combining these three forms of analysis meant that the data was considered in three different ways and the findings of these different approaches could be triangulated (Denzin & Lincoln, 2003). The following sections describe the three forms of analysis, showing how they were developed, how they have previously been used and why they were employed in the current study.

4.6 Sociocultural discourse analysis

Recent research into the construction of knowledge through dialogue and, specifically, of how students and tutors employ 'language to introduce new information, orientate to each other's perspectives and understandings and pursue joint plans of action' (Mercer, 2004, p166) has employed sociocultural discourse analysis. Mercer and his colleagues used this method to analyse transcriptions of educational dialogue in the classroom (Mercer, 2004; Mercer, et al., 2004). It is a form of discourse analysis, an umbrella term for approaches that involve the explicit analysis of spoken or written language to examine the content, structure and processes of human communication.

Sociocultural discourse analysis was developed in order to analyse how spoken language is used as a group tool, and is used to study the use of 'language to introduce new information, orientate to each other's perspectives and understandings and pursue joint plans of action'(Mercer, et al., 2004, p166) It focuses on the ways in which language is used in joint activity. Unlike conversation analysis, which tends to be concerned with the

organisational structure of spoken language, sociocultural discourse analysis is concerned with the content and function of talk, with its cohesive nature and with the ways in which shared understanding is developed over time in a social context (Mercer, et al., 2004). To achieve this, it combines detailed analysis of talk in specific events with comparative analysis of dialogue across a sample of cases.

Like other forms of discourse analysis, such as conversation analysis and discursive psychology, sociocultural discourse analysis was developed for the analysis of speech and has rarely been used for the analysis of online dialogue (de Jong, Kolloffel, van der Meijden, Kleine Staarman, & Janssen, 2005; Riley, 2006). However, its theoretical basis and underlying assumptions make it a useful method of studying how groups use dialogue to work collectively. It draws on the sociocultural views that learning involves participating in cultural practices (Lave & Wenger, 1991) and that learning activities cannot be separated from the context in which they take place (Sfard, 1998). It therefore retains the data as a whole for analysis rather than abstracting and coding selected sections.

In previous studies, sociocultural discourse analysis has been applied to speech and, most commonly, to classroom talk (Mercer, 2004; Mercer & Littleton, 2007; Mercer, et al., 1999; Rojas-Drummond, et al., 2006). Its previous use in the classroom environment is particularly relevant, because it was employed to identify and contextualise characteristic features of the three social modes of thinking used in this thesis to examine the co-construction of knowledge: disputational, cumulative and exploratory dialogue. These features include the assertions and counter-assertions used in disputation, the confirmation, elaboration and repetition that suggest accumulation and the challenges, explanations and evaluations indicative of exploration. Extending the use of this method to include the study of social modes of thinking in online educational dialogue thus increases the transferability of this research.

When the data retained for analysis is originally speech, there is necessarily some alteration as transcription mutates it from spoken to written form. A transcript can only be a partial representation of an interaction because the transcriber must decide which elements – words, accent, stress, hesitation, gestures and pauses – are significant. Unless the transcriber understands the discourse practices of the group, meaningful elements such as silences can be overlooked (Green, Franquiz, & Dixon, 1997). Pauses and intonation are rarely considered relevant to sociocultural discourse analysis, and therefore are not recorded in written form. Asynchronous dialogue, on the other hand, can be analysed in its original form, so more elements are retained for analysis.

Because sociocultural discourse analysis leaves contextual cues in place, it supports analysis of talk in a temporal context and study of the relationships between interactions that occur at different times. In the case of asynchronous dialogue, this study is facilitated because FirstClass software automatically records the message history of any posting: including information about who created it and when, who replied to it and when, who forwarded it and when, who downloaded any attachments and when they did that; and the date and time at which individuals first opened each posting or marked it as read. These message histories are not automatically presented when a posting is opened, but they can be viewed by anyone who has access to the conference. This information contextualises turns in the dialogue not only in relation to those turns that precede and follow them, but also in terms of pace, timing and periods of silence or absence. It thus aids analysis of how a group's shared understandings develop over time.

Published sociocultural analysis is usually illustrated by examples of transcribed talk that allow readers to assess the analyst's interpretations. In the case of asynchronous dialogue, readers can view screen captures of the original postings, rather than a transcribed version of that data. This increases the confirmability of the analysis by making clear the links between the data and its interpretation.

The preservation of the data as a whole in its original form, together with contextual cues, suggest that sociocultural discourse analysis can be applied to online dialogue as it can to offline dialogue. However, in Chapter 7, the analysis moves one step further away from the study of synchronous face-to-face talk as the focus shifts from conference postings to the documents attached to those postings. Although online learners often include in their conference postings phrases such as 'Speak later' that emphasise connections between written and spoken dialogue, there is no comparable evidence that they regard attached documents as a variant form of spoken dialogue. Attached documents are more akin to written assignments, and the dialogue most likely to be associated with such assignments – the written work and its assessor's comments – is very different from speech.

Although there are analogies to be made between attached documents and assessed written work, the two are not directly comparable. As Chapter 7 demonstrates, online students engage in dialogue through attachments, and this dialogue potentially includes characteristic features of disputational, cumulative and exploratory talk (Mercer & Littleton, 2007). Attached documents are important elements in the development of shared understanding over time in a social context through dialogue. For that reason, sociocultural discourse analysis is employed here as a method of understanding that dialogue.

Social discourse analysis supports study of the co-construction of knowledge over different periods of time, as well as the negotiation and avoidance of unproductive interaction. However, as the discussion above shows, applying this form of analysis to conference postings and attached documents is clearly a new use of the method and, in the past, researchers have not had to deal with textual elements of data. Typographical elements, the ordering and reordering of speech, and system-generated elements such as information about speakers and readers are not relevant to analysis of spoken educational dialogue, but these elements of a text's composition are potentially important for an understanding of asynchronous educational dialogue.

Because the dataset included these significant visual elements that affected its coherence and meaning, it was important to analyse the composition of the dialogue alongside its content. Learners construct meaning not only through language, but also through a multiplicity of modes of communication (Kress, Jewitt, Ogborn, & Tsatsarelis, 2001). When they employ asynchronous dialogue, they do not only communicate through their choice of words, they also employ layout, type size, colour, font, icons, shading, punctuation, numbering, emoticons, spacing, use of bold and italic, hypertext links, capitalisation and other typographical and layout elements.

Much of the meaning of this dialogue is carried by its visual elements.

> What is expressed in language through the choice between different word classes and clause structures, may, in visual communication, be expressed through the choice between different uses of colour or different compositional structures. And this will affect meaning. Expressing something visually or verbally makes a difference. (Kress & van Leeuwen, 2006, p2)

In the case of such composite texts, Kress and van Leeuwen (1990) demonstrated that the visual and verbal elements interact with and affect one another, and should therefore be analysed as an integrated whole. They developed a grammar of visual design to support understanding of these elements. That grammar has since informed the development of visual analysis (van Leeuwen & Jewitt, 2001), which is employed here to examine the uses and meaning and significance of these elements within online educational dialogue.

4.7 Visual analysis

This integration of the visual and the verbal takes place across both space and time (Kress & van Leeuwen, 1990, 2006). Spatial composition is integrated by layout and temporal composition by rhythm. Texts in which different elements are co-present, such as conference postings, are integrated by layout. This helps readers to understand a text by locating meaningful elements in the whole and thus relating them to each other. It has six

structuring principles, described below: salience, perspective, balance, frames, vectors and reading paths (Kress & van Leeuwen, 1990).

These principles form part of the grammar of visual design developed by Kress and van Leeuwen in order to support the analysis of texts in which different semiotic modes play a vital role, and to open new perspectives on language through examining those modes (Kress & van Leeuwen, 2006). This grammar has been used to resource various forms of semiotic analysis, particularly social semiotic analysis (Holsanova, Rahm, & Holmqvist, 2006). Its use here is as visual analysis, a sub-set of semiotic analysis (van Leeuwen & Jewitt, 2001). Visual analysis is itself a wide field, encompassing paintings, film, television, icons and a host of other representations. It has not previously been applied to conference postings and their attached documents, and its use here is perhaps most closely aligned with work by Jewitt and Oyama (2001) on the construction of science texts. The structuring principles identified by Kress and van Leeuwen are used here to understand the visual elements of the asynchronous data and to relate them to the verbal elements.

4.7.1 Salience and perspective

Salience is the relation of meaningful elements to one another in a text; how they are arranged in coherent order. Where and when elements appear in a text marks them as more or less important. In this printed thesis, for example, the titles and sub-titles are marked as more salient than the body text, and the page numbers as less salient. Viewers of spatial compositions such as this page are able to draw on their previous experience to judge the weight of the different parts. ‘The greater the weight of an element, the greater its salience’ (Kress & van Leeuwen, 2006, p202). Visual weight is affected by cultural expectations, and is indicated by the interplay of factors such as size, focus, tonal and colour contrasts and the use of symbols or images.

4.7.2 Balance

Viewers distinguish the central message of a composition and its dependent elements by judging how they are balanced. To do this they must take into account both the visual weight of items and how they are positioned. Top and bottom, left and right, centre and margins all have significance and are all to some extent dependent on the viewer's perspective. On a page with no sub-headings or images, the eye of the English reader would typically first be drawn to the top left, although only rarely to the smaller text that makes up the page header and is set at the margins. Perspective may change the meaning of the page if it is, for example, too close to the reader, too far away, unlit or upside down.

4.7.3 Frames

Frames distinguish different sections of a composition. 'The stronger the framing of an element, the more it is presented as a separate unit of information' (p203). Frames do not have to be linear containers; they can be represented by colour, by typographical elements or by spaces. Text is typically framed by punctuation and spacing; letters are bound into words by the spaces that frame them, and these words are linked into units by punctuation, and into larger units by the spaces that mark out different paragraphs. Frames are used both to separate and to link elements.

4.7.4 Vectors and reading paths

While frames separate different areas, vectors connect them by leading the viewer from one element to the next, prioritising the most salient items. They thus encode a reading path, a preferred route through the text. In densely printed pages of text the reading path is strictly coded for English readers, and proceeds from left to right, from top to bottom and line-by-line. However,

> The more a text makes use of subheadings, emphatic devices (italics, bold type, underlining), numbered lines of typical elements or characteristics of some phenomenon, tables, diagrams and so on, the more likely it is to be scanned, skip-read, 'used' rather than read: linear reading is gradually losing ground (Kress & van Leeuwen, 2006, p205).

This is important in the case of asynchronous dialogue; it cannot be presumed that postings either are read in a linear fashion or, given the many different possibilities for the ordering of postings, that they could be read in such a fashion.

In order for groups of learners to be able to make use of these integration codes to make sense of their asynchronous dialogue, they must develop a shared understanding of the nature and context of their dialogue and the semiotic codes on which it draws. To understand these elements of the dialogue, this thesis therefore integrates sociocultural discourse analysis with visual analysis to show how learners build meaning through and within their dialogue. The structuring principles of layout distinguished by Kress and van Leeuwen (1990; 2006) are employed to understand the visual elements of the asynchronous data and to relate these to the data's verbal elements. In order to support this analysis of the asynchronous conference data, the interview data was subjected to thematic analysis in order to identify patterns within it (Braun & Clarke, 2006).

4.8 Thematic analysis

Thematic analysis is often loosely defined, or regarded as a process that forms a subset of another analytic tradition. Ryan and Bernard (2000) define themes as 'abstract (and often fuzzy) constructs that investigators identify before, during, and after data collection' (p82). For them, themes are elements of grounded theory, schema analysis and content analysis.

Braun and Clarke (2006) consider thematic analysis to be a distinct approach that is a 'foundational method for qualitative analysis' (p78). They consider it to be a flexible and useful research tool that has the potential to provide a rich, detailed and complex account

of data. In writing about it, their aim was to enable researchers to apply it in a way that was both theoretically and methodologically sound by providing methods of identifying, analysing and reporting patterns within a dataset. They criticise descriptions of the method that imply themes emerge from the data, or are discovered within it, while omitting the active role played by researchers in identifying these themes. They also stress that thematic analysis cannot be accurately evaluated if there is no explanation of why this type of analysis was undertaken, what counted as a theme and how these themes were identified.

In this study, thematic analysis was used to address the subsidiary research question: 'How do groups of learners, working together in asynchronous environments, negotiate and attempt to avoid unproductive interaction?' Asynchronous conference data alone could not provide sufficient evidence to answer this question because, as Chapter 6 shows, silence is an important part of these processes. It was therefore difficult to interpret the conference data accurately without the accounts of their interaction that learners and tutors provided in the epistolary interviews.

Thematic analysis was applied to all the interviews in order to identify patterned responses, or themes, within the data set that related to the negotiation and avoidance of unproductive interaction and so could be used to help address the research question. Themes that shed light on conference data were selected for further analysis. The priority was not to give a rich account of the interview data, but to identify themes that were frequently expressed in the interviews but were not apparent, or barely apparent, in the conference data.

The most important themes identified through this analysis were the roles of silence within the project group conferences, the difficulties involved in making decisions in online groups and the significant tensions associated with these two issues. These themes are central to the analysis in Chapter 6, but they also inform the analysis of the conference data that is reported in Chapters 5 and 7.

Chapters 5, 6 and 7 are concerned with the analysis of conference and interview data. Each of these chapters focuses on answering one of the three subsidiary research questions. Chapter 5 deals with the co-construction of knowledge in the short term, Chapter 6 is concerned with how learners negotiate and work to avoid unproductive interaction, and Chapter 7 extends the analysis by dealing with the co-construction of knowledge over extended periods of time. In terms of the social modes of thinking introduced in the Literature Review, Chapter 5 relates to cumulative dialogue, Chapter 5 focuses on the unproductive interaction associated with disputational dialogue, and Chapter 6 shows how online learners engage in exploratory dialogue.

5 Co-construction of knowledge over short periods

This chapter addresses the question: 'how do groups of learners co-construct shared knowledge by building links across postings in asynchronous dialogue?' The literature makes it clear that their methods of doing this are likely to change over time (Mercer, 2008). In the short term, they need to develop and make use of methods of binding their contributions together to form coherent dialogue. In order to develop shared knowledge together, this dialogue may be cumulative, characterised by repetition, confirmation and elaboration as a previous study of asynchronous conference dialogue found (Littleton & Whitelock, 2005). It may also involve the explanations, explicit reasoning, challenges and counter-challenges that identify exploratory dialogue.

In order to answer the research question, the chapter focuses on the first week of the project group conferences, when students were meeting each other, initiating and developing their group project, and learning to work together online. The chapter first identifies methods by which learners build links across postings, identifying where, how and why they encounter problems. It then identifies and examines a new set of discursive devices used by groups of learners to co-construct shared knowledge in an asynchronous environment. Finally, it considers whether the dialogue they construct together can usefully be characterised as cumulative, disputational or exploratory.

5.1 Data set

As the focus is on the development of dialogue in the short term, the analysis in this chapter focuses on the first week's postings in each of the three project group conferences described by the pseudonyms Jet, Sapphire and Pearl. This section of the data corpus was selected because during this week, from Friday 10th November to Thursday 16th November, the majority of learners in these groups were working collaboratively online for the first time and, without meeting face to face, were developing the working relationships and shared context that would support future development of shared knowledge.

At this point in the course, all three project groups were engaged in comparable activities and so studying learners' activities during this week was intended to increase the dependability of the data by showing that the results of the analysis were applicable to similar sets of data. In later weeks the groups diverged as they developed and carried out different research projects, and so data from these weeks was not as directly comparable. During this first week, each group had to develop and agree a proposal for research to be carried out together, then submit their collaborative proposal for assessment. Groups of learners were required to develop their research question jointly, agree approaches to data collection and analysis and collectively identify literature to be included, theoretical framework and relevant ethical issues.

Objectives for this week were linked to the course's second learning outcome: 'Work with others to carry out the stages of drafting research proposals, data collection, analysis and interpretation' (Nettle, et al., 2006, p6). More specifically, the Study and Assessment Guide for the course stated:

> The main aim of this week is to complete and submit the project proposal form. To this end your project group will need to discuss and finalize key points relating to the design and methodology you will employ. (Nettle, et al., 2006, p81)

The unpublished notes for senior tutors, who monitored the work of several project groups, advised that in this first week 'Students need to get down to some serious work, they need to consider background to the project they want to do: so they should spend time reading papers'. They also made the point that students were 'in the early stage of group formation which brings its own challenges'.

As a result of the demanding workload imposed by the course during this week, over a quarter of the total conference messages each group posted during the six weeks they worked together were written during these six days. This was another reason for choosing to focus on this section of the data. During this period, 52 messages were posted by the five students and one tutor in Sapphire, 72 messages were posted by the four students and two tutors in Pearl, and 176 messages were posted by the seven students and three tutors in Jet. The Jet figures include the contribution of a 'floating tutor' who provided temporary cover for the planned absence of a tutor.

The project groups differed in the types of data they were intending to analyse, and in the focus of the study they were developing. Pearl and Jet groups can be considered comparable in that both groups had the same tutors, both researched the psychology of communication, both decided to use qualitative analysis, and both opted to choose between the same seven clips of video data. By contrast, Sapphire group had a different tutor, and members developed a quantitative research study based on the psychology of memory.

The account of the analysis presented here is structured around an exemplar thread (see Figure 1 below) taken from Jet, selected because it contained nine postings and was the longest threaded discussion of the first week in any of the three conferences. It therefore clearly showed the variety of strategies learners used to link their postings into coherent dialogue. Although the account focuses on a small number of postings, it represents an analysis of all the 300 conference postings from the groups in the first week, an analysis

that was then extended to the subsequent five weeks, when the groups had established working relationships and work patterns.

With seven students, two main tutors and a supplementary 'floating' tutor, Jet was an unusually large group that had to manage a complex series of interactions. The exemplar thread is of particular interest because this one discussion deals with a variety of subjects important for learners starting to work together, including project development, goal setting and timetabling. Students engaged in the thread had just three days' experience of working as a group online and they were two days away from the assessment deadline for submitting their group project proposal form (PPF). They were still developing ways of working together, reaching consensus and agreeing a shared history. This thread therefore supports a detailed investigation of how groups of learners build coherent dialogue in the short term and use this to construct shared knowledge.

The data analysis illustrates that group members quickly develop accepted ways of producing coherent dialogue. These involve the use of discursive devices that have not previously been documented: constructive synthesis, the proposal pattern and powerful synthesis. Group members also use layout and typography to assist them in developing complex discussions. Because learners access the conference at different times of the day and night, and are never all online at the same time, decisions take a long time to make and groups use a variety of methods to avoid time-consuming disputes or challenges.

5.2 The need for cohesive dialogue

The message histories of Jet, Pearl and Sapphire groups demonstrate that asynchronous students differ in their working patterns, and that individual learners are rarely online at the same time as the rest of their group. Links within their dialogue are therefore not the second-by-second, minute-by-minute links of face-to-face talk but must be sufficiently robust to extend over hours or days. Figure 1 is an example of one set of learner interaction

patterns, based on the nine-post threaded discussion by Jet group on which analysis in this chapter is focused. It shows the times at which each of the nine postings was written and the times at which these were first accessed by each student and tutor. The thread is not typical, partly because it is long, and partly because the students were approaching a deadline, but it serves to emphasise that the rhythm and timing of the dialogue were different for each participant.

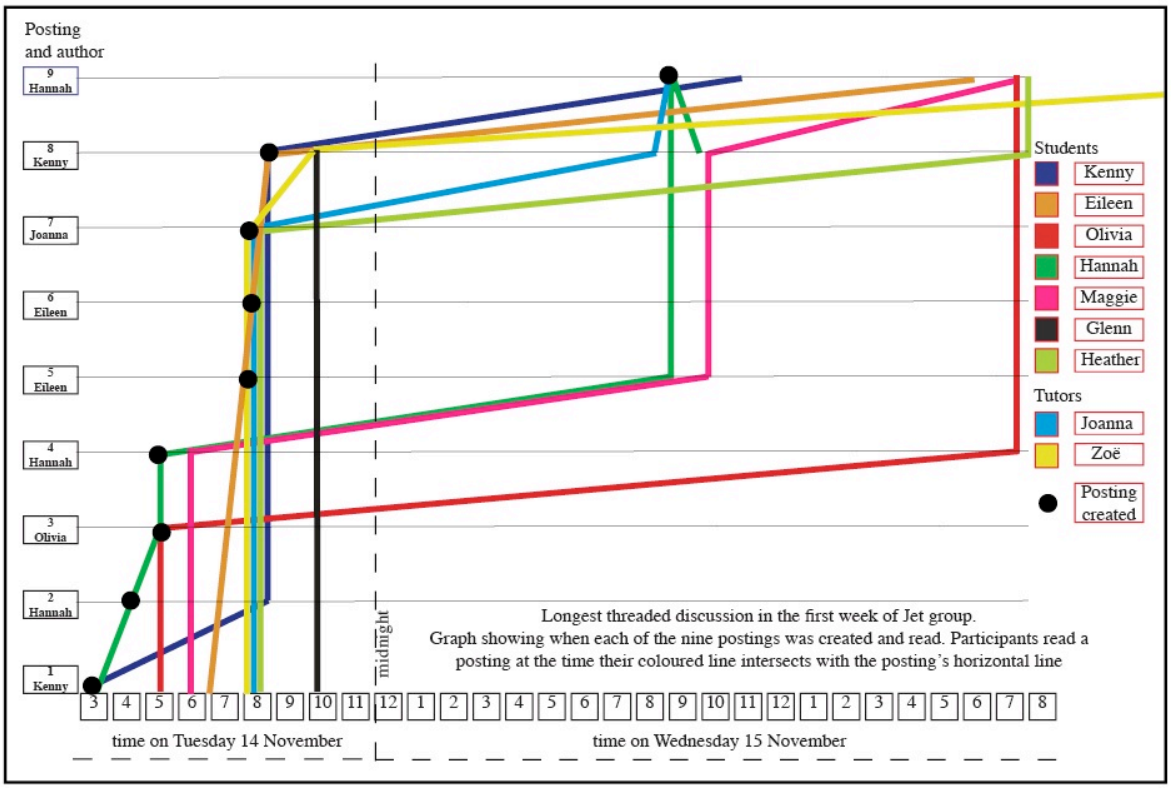


Figure 1: Interaction patterns from nine-post threaded dialogue within Jet group.

The figure shows how complex the patterns of interaction can become in a single threaded discussion in an asynchronous group. All nine members of the Jet group accessed postings in the thread, which were contributed by four students and one tutor. The time at which each posting was created is indicated in the figure by a black dot. Kenny created the first posting at around 3pm on Tuesday; Hannah posted the last one around 9am the following morning. The coloured participation lines of individuals intersect with the grey posting lines at the time at which the posting was opened. Thus the red line shows Olivia opening

postings 1, 2 and 3 late on Tuesday afternoon, and accessing all other postings in the thread early on Wednesday morning. The figure shows that it took between six hours and several days for any individual posting to reach the entire group.

Learners' direct engagement with the thread extended over 30 hours. During this time, group members experienced the discussion in different ways. Glenn (represented by the black line) opened the first eight postings one after another in the late evening, did not contribute to the discussion, and never opened the final posting. Tutor Zoë (represented by the yellow line) opened the first four postings in quick succession and each of the subsequent four postings as it appeared, but did not open the final posting until several days after the period covered by Figure 1. Olivia (red line) opened the first two postings and created Posting 3 in the early evening on Tuesday, but 24 hours passed before she logged on to look at the responses she received. Maggie (pink line) opened the first four postings early Tuesday evening, the next four the following morning, and the last one the following evening. Hannah (dark green line) was very involved in the early discussion, but logged out in the early evening and did not post again until the following morning.

This graphical representation of interaction patterns indicates one of the reasons why group members may experience problems in developing coherent discussion and building shared knowledge. Individual students and tutors in Jet group probably spent only a short period of time considering the nine messages in this thread. However, the group as a whole took a day and a half to produce and read it. This slow pace of discussion made it difficult for groups to proceed quickly, even though they were approaching an important deadline. Even a proposal that was readily accepted by everyone could not be agreed for several hours. Any disagreement between group members had the potential to delay progress for days, so groups needed to avoid unproductive conflict in order to meet deadlines.

The participation patterns of students also meant that a change in the direction of the group was likely to be a serious problem for students who checked the conference once a day rather than logging in regularly. Students' offline work built on their online discussion, on what had already been agreed, and on their expectation of how the dialogue would proceed in future. If the online conversation took an unexpected turn after they had logged out, they could waste hours on tasks that were no longer required. On the other hand, if discussion dragged on without getting anywhere, as is the case with extended talk, they would also have difficulty in moving on and meeting their deadlines. This suggested that they would benefit if the co-construction of knowledge over short periods of time were cumulative, building on previous contributions and producing no unexpected surprises.

5.3 Creating cohesive dialogue

To achieve this, learners and tutors made extensive use of cohesive ties to link individual postings. Members of each group used these ties when completing a major task of the first week of group work: the joint production of a coherent and workable project proposal. Discussion of the project proposal continued in all three groups throughout the week; the threaded discussion by Jet group is used as an exemplar of the techniques used in order to show how these techniques were used. In this nine-post thread, as in other threaded discussion, cohesive ties were employed to connect, produce and develop talk about the subject matter identified in the thread's title which, in this case, was the rescheduling of synchronous discussion and production of draft project proposals. Group members also used cohesive ties in order to establish adjacency, so that coherent conversation was possible in their asynchronous setting. Within the thread, use of cohesive ties began at the start of the first posting (Figure 2).


From: Kenny Pseudonym

Subject: Best use of time-defer livechat till tomorrow+draft up PPFs to discuss

To: DZX999 Jet

Date: Tuesday 14 November, 2006 3:44 PM Message history

Hi

I'm PROPOSING that

1. we defer livechat 'till tomorrow (timing difficulties)
2. prepare and post rough draft PPFs for clips which we as a group think have enough for us to work on (see below) & do this tonight.
3. pick one by middnight tommorrow (Wed), agree final PPF content Thurs eve.

Please let me know what you think. I'd be happy to have a go at PPFs 1-3, but they will be a bit sketchy because of time constraint. Other volunteers needed-perhaps we can then compare notes/pick the best as a group.

Bye'

Kenny

PPF 1. Dr. consultation (clip 4)
PPF 2.Young women talking (clip 2)
PPF 3....anything else someone is passionate about.

(On a personal note, clip 3 (male/female group discussion) seems to me to have plenty of potential for thematic analysis. But the sound quality is so poor, it kind of rules itself out.
Views of others would be appreciated. But I will try to put something down on paper.)

Reply | Reply with quote | Forward

Figure 2: Jet thread Posting 1.

Posting 1 used cohesive ties both to draw on course materials and earlier postings, and to structure future dialogue. Its title, 'Best use of time – defer livechat till tomorrow + draft up PPFs to discuss', did all of these things. The author, Kenny, employed two terms that built on postings he had written the previous day: 'PPF' and 'livechat'. PPF (project proposal form) was a term specific to that section of the course. It had been in use in the conference for less than a day. It was used seven times in this posting, firmly establishing it as shared group vocabulary that would be used hundreds of times in the ensuing weeks.

Similarly, 'livechat' was a term for synchronous discussion that group members were unlikely to have encountered before joining Jet and that Kenny had introduced to the conference the previous day. Again, he used the word without explicit explanation – the

implication was that group members had read and understood his previous postings and already shared an understanding of this specialised terminology, which was to be used throughout the conference. By making 'PPF' and 'livechat' central to discussion, he provoked other group members to consider in their postings how these terms could be used in their dialogue, and what they meant. A few hours later, fellow student Eileen posted, 'I will now put my mind to PPF (now that I've worked out what that stands for)', and the next day Hannah asked 'Do we just go to the Jet live chat room to chat? Never thought about it till now I don't really know how to do it!'

Kenny's title thus linked back to and prioritised elements of previous dialogue. The affordances of the medium supported this work because the software gave added emphasis to the title by setting it apart from the main body of the message. FirstClass postings are automatically filed under their titles, which are visible to anyone opening the conference, even if they choose not to read the message. While discussion moves on, these words continue to feature in the list of titles of conference postings. Without opening Kenny's message, other group members could connect it with previous postings such as 'Project Proposal Forms are ready', 'Scheduling a livechat tonight' and 'Earlier chat tonight?' At the same time, the title signalled what readers could expect to find in Kenny's posting, and suggested that subsequent dialogue would include discussion of the timing of livechat, and the drafting of project proposal forms.

Within the body of the message, Kenny continued to supply cataphoric prompts that could structure subsequent discussion. His first list was clearly labelled as a set of proposals that require response, and this set was followed by the direct request: 'Please let me know what you think.' Another numbered list distinguished between clips of video data. This use of numbering supported a more orderly discussion than would be typical in spoken dialogue. A set of three main proposals and numerous sub-proposals would be difficult to understand and retain if presented as a single turn of speech and it is unlikely that each one would be

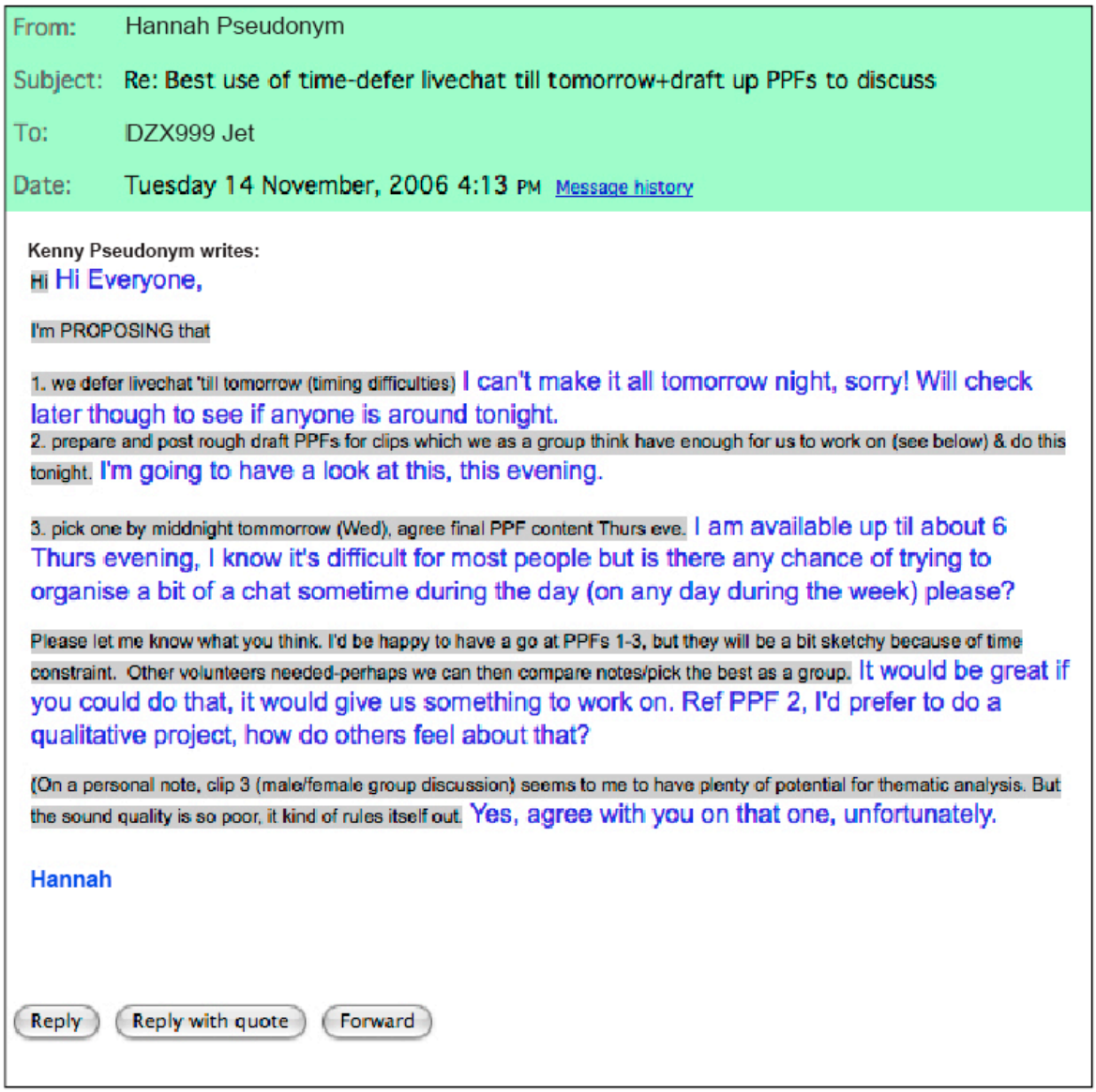
followed up. On the other hand, if these options and sub-options had been presented singly in speech, Kenny's ideas would not have appeared as a coherent set, but would have been woven between or buried amongst the contributions of other group members. Framed separately in their textual form, the proposals carried added weight because they were presented in an orderly and coherent manner.

Kenny's use of the affordances of the software and his use of cohesive ties situated his contribution within an ongoing dialogue. His success at achieving this can only be gauged with reference to subsequent posts by other group members. However, because asynchronous discussion is chronologically fragmented, not all subsequent posts were relevant to Kenny's. Jet began, continued and finished several other short threaded discussions while this dialogue was in progress. Turns did not necessarily follow each other, as conversational partners entered and left the conference at different times, and different discussions were woven together in a continuous list of postings.

Posting 2 (Figure 3), Hannah's direct response to Kenny's posting, was the next posting to be written in the conference and appeared within half an hour of Posting 1 (Figure 2). If readers viewed their posts chronologically, Hannah thus signalled a relationship between the posts by their adjacency. However, others may not have had their conferences ordered in this way – theirs may have been arranged by topic or by author. It was important, therefore, that group members had other means of establishing adjacency between postings. To develop the discussion coherently in this way required work by each author as well as by the readers.

Learners communicating through FirstClass software can establish a threaded connection and thus link their postings with previous ones by choosing to 'Reply' to a previous contribution rather than to 'Write' a new posting. Hannah did this with Posting 2 (Figure 3), linking it to Posting 1 by responding with a reply, rather than with a new message, in

order to establish the threaded connection. In addition, she chose to 'Reply with quote'. The FirstClass software automatically copied and highlighted the block of text she had chosen to quote and, at the same time, made a note at the top of who had been quoted. Firm ties were thus established between Posting 1 and Posting 2. Kenny prompted a multi-part response by loading Posting 1 with the first parts of adjacency pairs – 'Please let me know what you think' and 'View of others would be appreciated' – and Hannah completed these pairs in her posting by giving her views and thoughts on his proposals.


From: Hannah Pseudonym

Subject: Re: Best use of time-defer livechat till tomorrow+draft up PPFs to discuss

To: DZX999 Jet

Date: Tuesday 14 November, 2006 4:13 PM Message history

Kenny Pseudonym writes:

Hi Hi Everyone,

I'm PROPOSING that

1. we defer livechat 'till tomorrow (timing difficulties) I can't make it all tomorrow night, sorry! Will check later though to see if anyone is around tonight.

2. prepare and post rough draft PPFs for clips which we as a group think have enough for us to work on (see below) & do this tonight. I'm going to have a look at this, this evening.

3. pick one by middnight tommorrow (Wed), agree final PPF content Thurs eve. I am available up til about 6 Thurs evening, I know it's difficult for most people but is there any chance of trying to organise a bit of a chat sometime during the day (on any day during the week) please?

Please let me know what you think. I'd be happy to have a go at PPFs 1-3, but they will be a bit sketchy because of time constraint. Other volunteers needed-perhaps we can then compare notes/pick the best as a group. It would be great if you could do that, it would give us something to work on. Ref PPF 2, I'd prefer to do a qualitative project, how do others feel about that?

(On a personal note, clip 3 (male/female group discussion) seems to me to have plenty of potential for thematic analysis. But the sound quality is so poor, it kind of rules itself out. Yes, agree with you on that one, unfortunately.

Hannah

Reply Reply with quote Forward

Figure 3: Jet thread Posting 2

Her use of quotation enabled Hannah to show how she had interpreted and developed Kenny's words and others could follow how the discussion was developing. Threading and quotation do not automatically clarify the flow of ideas because, unedited, they may weight elements of a posting in a misleading fashion. In this case, though, Hannah created reading paths through the different sections of her posting, establishing a clear and comprehensible connection to Kenny's input. She was able to do this partly because of the way in which Kenny laid out his original message, and partly because of the ways in which she handled the cohesive ties within her message. These ties made use of the affordances of the medium and were therefore much more apparent than they would be either in spoken conversation or in other forms of textual communication.

Hannah embedded the majority of Kenny's original post within her own, thus stressing its salience within the continuing dialogue, she wound her words around his suggestions and produced six separate responses within one message – framing them so each clearly referred to a separate section of the original. This division allowed her to develop different parts of his message in different ways. At the same time, she avoided the implication that this was a conversation limited to the two of them by addressing her remarks 'Hi Everyone' and, like Kenny, asking for input from other group members: 'how do others feel about that'.

The use of numbering in Posting 1 (Figure 2) acted as a framing device that helped subsequent authors to develop a more orderly discussion than would be typical in spoken discussion. Because Kenny's ideas and suggestions were clearly separated, it was possible to respond to each in turn. When framing devices were not used in this way to prompt ordered response, subsequent discussion was limited because it focused on postings as blocks of ideas to be accepted or ignored en masse.

In the case of Postings 1 and 2, Kenny's division of his original posting into sentences, paragraphs and lists made it easy for Hannah to reply to each of his ideas by following the patterning of his posting. However, it was her use of typographical elements in Posting 2 that enabled other group members to identify reading pathways through her message, clearly separating her words from Kenny's original input. She made use of colour and layout to clarify and add visual weight to her response and, in so doing; she made use of the typography and layout used by Kenny in his original posting.

Kenny's initial posting (Figure 2) was lexically dense, containing far more information and propositions than would be possible in a typical turn of spoken conversation. He framed and weighted his ideas by the use of a series of layout devices: sentences, paragraphs, numbered lists and typographical division. He thus produced cataphoric prompts, implying that respondents should frame the subject matter in similar ways – as Hannah did in Posting 2 (Figure 3). Apart from the title and automatically generated header, Kenny's posting consisted of the main body of his message, and a form of postscript. This final section carried less visual weight than the earlier parts of the posting because it was divided from the main body of the message by a row of hyphens, and this lack of visual weight resulted in it being set aside by Kenny's respondents.

In Posting 2 (Figure 3), Hannah quoted the main body of Kenny's posting in full, but she chose to delete part of the final section, thus excluding it from the discussion. Kenny's first three-part list, which invited response, was retained; while the second three-part list that occurred after the division, was lost. The same division of his message took place in three separate postings during this threaded discussion; Kenny's initial message was quoted but nobody made use of his second list, despite the fact that the group was struggling to find clear titles for the different video clips and his second list provided a series of suggestions. Kenny's use of framing thus influenced decisions about the elements of his posting to be taken forward, and the visual weighting of Posting 1 appears to have been interpreted as an

indication that text below the dividing line was supplementary information that could safely be ignored.

In Posting 2 (Figure 3), if Hannah had presented both proposals and responses in the default 10pt Arial black typeface, it would have taken a lot of work for readers to develop a reading path through her posting that would distinguish her contributions from those of Kenny. Her use of colour and point size served as a shorthand way of weighting and framing the contributions of different individuals in an environment that lacks many methods of personalisation. The use of different colours and fonts was effectively modelled from the start by tutors in Jet and Pearl acting as discourse guides.

However, in Sapphire the tutor kept to 10pt Arial black and so did all the students – which made the sort of detailed response seen in Posting 2 much more difficult to implement or understand because fewer weighting and framing devices were employed. Hannah made use of typography in order to build clearly on Kenny's input. Her use of 14pt Arial blue drew the eye to her input and to the interplay between the given and the new by increasing the visual weight of her contribution. Use of different colours, fonts and font sizes allowed complex discussion to develop, with clear ties between separate postings, because reading pathways through the material could be clearly distinguished. In later postings, members of Jet used these elements to weight the input of up to four people in one posting.

Online learners may be expected to have extensive experience of employing techniques for sense-making that are used in classroom talk, such as questions and answers or making reference to other contributions. However, their experience of asynchronous dialogue is likely to be limited, and they frequently encounter problems due to their unfamiliarity with the use of typographic elements to structure and make sense of academic dialogue. The evidence from Jet, Pearl and Sapphire suggests that online learners rely on their tutors to act as discourse guides. When methods of creating coherent dialogue were not modelled in

Sapphire, these students found it difficult to link postings to form extended dialogue as well as to develop shared vocabulary and communication patterns, and these difficulties limited their ability to build shared knowledge together.

5.4 Problems within the dialogue

The learners in Jet, Pearl and Sapphire rarely used typographic devices to order and integrate their postings until these had been introduced and modelled by more experienced users, typically the tutors. Developing online visual literacy was not one of the learning objectives of the course and so, while tutors may have helped to develop learners' online visual literacy by acting as discourse guides they were not encouraged to do so.

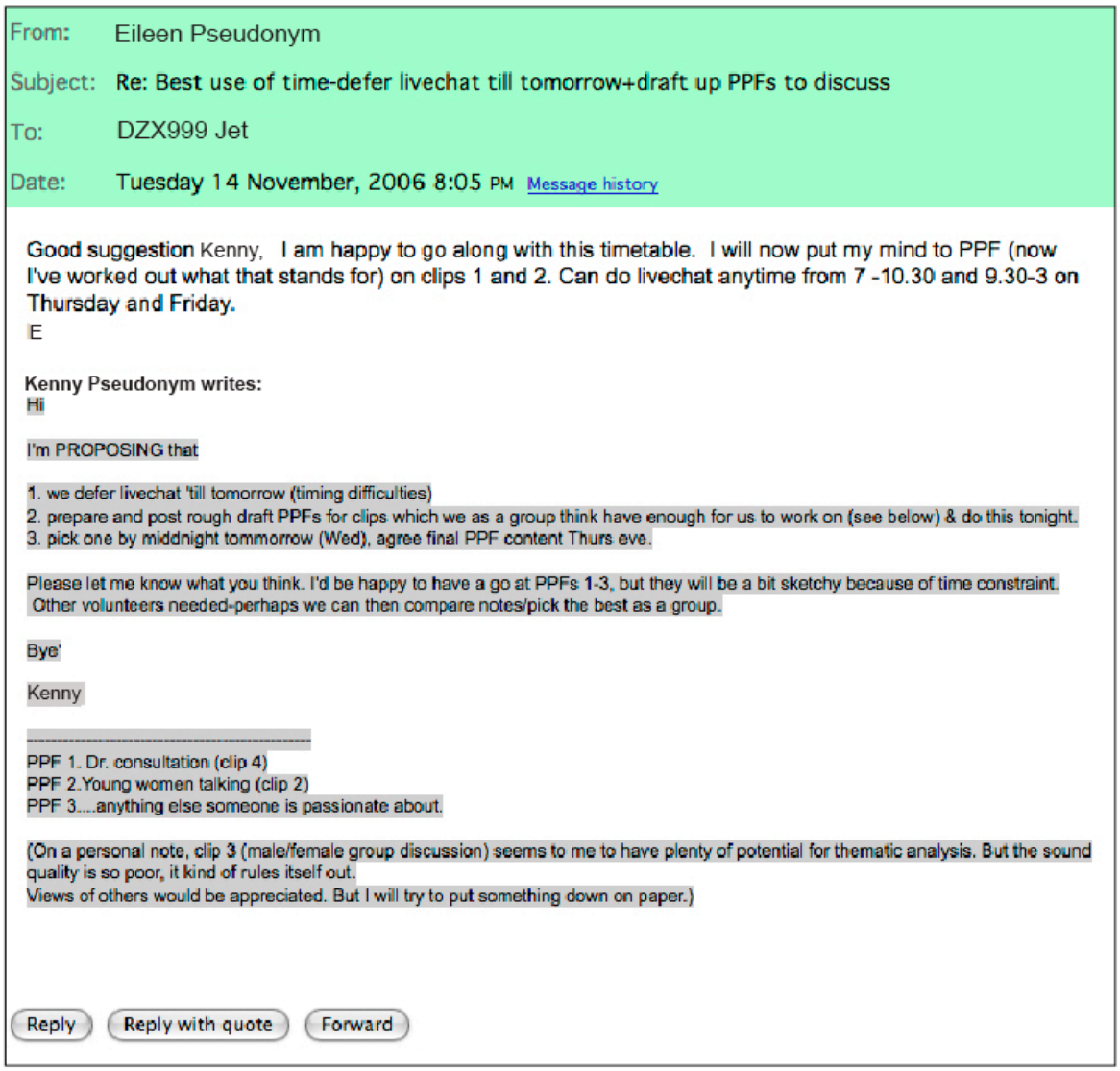
Jet and Pearl group members saw threaded dialogue modelled by their tutors and themselves used a lot of threading. However, members of Sapphire group struggled to use this method of signalling adjacency. Instead, they repeatedly used the question-and-answer pair to achieve this. This resulted in an unnecessary duplication of effort. When two Sapphire students posted similar queries about the project proposal form, they received the same information from another student and from the tutor, who answered both individually. Information that could have been supplied just once if threading had been used effectively was repeated three times. Not only did this create extra reading and writing work, it also broke the discussion into exchanges between pairs of individuals rather than linking them as a group.

Sapphire group members were also limited in the options that they saw modelled for taking ideas forward. This was partly because they were a small group and only had one tutor acting as their discourse guide. In Posting 1 (Figure 2), Jet group member Kenny separated a series of ideas and proposals by the use of a series of framing devices, implying that respondents should divide the subject matter in similar ways. This division was supported by fellow Jet student Hannah's use of different colours and fonts in Posting 2 (Figure 3).

Sapphire group members did not see these techniques modelled, and therefore had trouble in responding to and developing complex postings.

When one Sapphire student wrote a 365-word message containing a series of proposals for experiments and themes, based on literature research she had done, she did not create a clear reading path through her posting by numbering or labelling her proposals, nor did she weight these proposals. The group therefore found no way of dealing with each one individually. She received bland responses such as, 'Georgia had some good ideas'. In fact, the group's reliance on question-and-answer adjacency pairs limited the discussion even further. After one of the many proposals in her message, Georgia addressed a question directly to the tutor: 'What would your thoughts on this be Philip?' He responded that this seemed complicated and thereafter students took this criticism as applying to all Georgia's proposals. As a result, the group failed to take forward any of her ideas about context, depth of processing, elaborative rehearsal or long-term memory.

Members of Jet group used a wider range of techniques to develop coherent discussion. When a group member failed to draw on shared knowledge of these devices, it resulted in significant disruption to the group. This occurred in Posting 6 (Figure 4) of Jet's nine-post threaded discussion, when Eileen confused the threaded naming of connected postings, and ignored the convention within the group that authors built on related postings. If, as in this posting, individuals do not use vocabulary and communication patterns in the same ways as others, or if they fail to make use of information that has been shared with the group, it quickly becomes difficult for other group members to make sense of their input and there is a breakdown in communication. Because, within this posting, Eileen did not draw on the group's common knowledge and understanding of how their discussion cohered, the group was unable to resolve one of the two main issues which they were discussing: the timing of their next synchronous discussion.


From: Eileen Pseudonym

Subject: Re: Best use of time-defer livechat till tomorrow+draft up PPFs to discuss

To: DZX999 Jet

Date: Tuesday 14 November, 2006 8:05 PM Message history

Good suggestion Kenny, I am happy to go along with this timetable. I will now put my mind to PPF (now I've worked out what that stands for) on clips 1 and 2. Can do livechat anytime from 7 -10.30 and 9.30-3 on Thursday and Friday.
E

Kenny Pseudonym writes:
Hi

I'm PROPOSING that

1. we defer livechat 'till tomorrow (timing difficulties)
2. prepare and post rough draft PPFs for clips which we as a group think have enough for us to work on (see below) & do this tonight.
3. pick one by middnight tommorrow (Wed), agree final PPF content Thurs eve.

Please let me know what you think. I'd be happy to have a go at PPFs 1-3, but they will be a bit sketchy because of time constraint. Other volunteers needed-perhaps we can then compare notes/pick the best as a group.

Bye'

Kenny

PPF 1. Dr. consultation (clip 4)
PPF 2.Young women talking (clip 2)
PPF 3....anything else someone is passionate about.

(On a personal note, clip 3 (male/female group discussion) seems to me to have plenty of potential for thematic analysis. But the sound quality is so poor, it kind of rules itself out.
Views of others would be appreciated. But I will try to put something down on paper.)

Reply | Reply with quote | Forward

Figure 4: Jet group Posting 6.

Posting 6 disrupted the coherence of group discussion by moving away from the group's usual method of creating adjacency links. Typical practice would have been to read every previously posted message, or every message in a thread, and then respond. Eileen disrupted the sequence and rolled the discussion back by responding to the first posting in the thread rather than to the most recent posting in it. As a result, one of the key indicators of adjacency in the conference was rendered useless: thread titles no longer helped readers to determine the order of the thread. 'Re' was written after 'Re (2)' and 'Re (3)' rather than before them. This confusion of numbering could not be repaired, and made it increasingly difficult to determine the development of the dialogue in this thread.

Although the message histories generated automatically by the software showed that Eileen had opened every previous message in the thread, she showed little awareness of anything that had taken place in it. She did not pick up on the established patterns of communication, vocabulary, opinions and shared information and this created ambiguity, demonstrating how easily asynchronous dialogue can be thrown off course. Despite the variety of names group members had already suggested for the data clips they were choosing between, Eileen did not build on these but used confusing new names: 'clips 1 and 2'. These may have referred to what Kenny in Posting 1 had termed 'PPF 1. Dr. consultation (clip 4)' and 'PPF 2. Young women talking (clip 2)', or to the first two clips presented on the course CD, but Eileen's meaning was far from clear. As a result of her failure to link references through the use of cohesive ties, her statement that she would put her mind to project proposals based on clips 1 and 2 was not useful to other group members and did not help anyone else to decide on their work schedule.

In addition, Eileen gave the times she was available for synchronous discussion without specifying am or pm. It would have been reasonable to assume that, by linking her posting into the threaded discussion, she was contributing to the ongoing dialogue and had taken previous contributions into account. In that case, she must have known of Hannah's lack of availability in the evenings, outlined in Posting 2 and thus Eileen's statement that she 'Can do live chat any time from 7-10.30' could be assumed to mean that she was available from 7am. In fact, it later became clear that Eileen had not oriented to Hannah's earlier contribution and that, by '7-10.30', she meant 7pm-10.30pm. As a result of this failure to construct coherent dialogue by building on information provided by others or by providing information on which others can build, the group failed to decide on a meeting time and ended up fragmented, holding both a morning meeting and an evening meeting. Seemingly minor infringements of the ways in which members of the group usually communicate thus reduced their ability to work together. It is important that each posting builds on those that

have gone before, that vocabulary is used in the same way by different people, and that group members use the shared knowledge and context that are available to them.

The asynchronous environment potentially offered students in Jet, Sapphire and Pearl the time to do this in a reasoned and considered fashion, drawing on interpretations of the exact, preserved words of everyone who had contributed to the dialogue. To make use of these affordances, they needed to develop skills that would allow them to avoid information overload and make effective use of their time together. Their choice of ways of working was limited by the constraints imposed by the university, which included assessment requirements and deadlines, and by the limitations of the FirstClass software that mediated their dialogue. They also had to develop ways of dealing with a learning environment in which group members rarely or never interacted at the same time.

5.5 Discursive devices for construction of shared knowledge

The staccato nature of asynchronous dialogue means that group discussion is a protracted process that is lengthened by disagreement. Groups with impending deadlines therefore need to develop ways of working that minimise interpersonal conflict. The participation patterns of learners also pose a problem, because students may waste hours, or even days, working on the wrong lines if online dialogue takes an unexpected turn after they have logged out. One of the students interviewed for this research did not have daily access to the conference in which he was working. He complained that his

> research group initially decided to select articles from four randomly selected newspapers over a three day period, 26th-28th, of November. As I am living in Greece I could buy the aforementioned newspapers with one day delay. By the time I had bought the first series of the newspapers some members of the group did not bothered to buy the rest of the papers and decided not to continue with that article collection

When discussion moves steadily forward, misunderstandings are identified and clarified quickly, and time-consuming disagreements and interpersonal conflict are minimised, learners in asynchronous groups benefit. These factors are important as they work to develop ways of establishing a shared history and a common understanding.

In an instructor-led face-to-face setting, teachers mobilise several discursive devices to help learners to select that which can usefully be taken forward from all that has gone before. These devices (introduced in Section 2.9.4) are also available to groups of learners who are involved in building knowledge together. Elicitation and exhortation prompt the recall of relevant experiences and information. Recaps represent the past, and responses may be repeated in an evaluative fashion that indicates the weight accorded to each element. Each of these devices helps learners to construct a shared history of what has gone before. These techniques also signal which information and experiences individuals consider should be taken forward, and which can be set aside.

In a face-to-face setting these discursive devices are useful because they help to overcome the constraints imposed by using speech as a communication medium. Pursuing a line of thought systematically and preserving the understanding that has been achieved is difficult when words are gone as soon as they are produced. In an asynchronous setting, learners' concerns are different. They do not need to employ devices that will help them to remember what they have said or done, because they have access to the complete text of their past dialogue in a transcript automatically generated by the software. What they need to replace is the range of tones, expressions and gestures available to support sense making in a face-to-face setting. They must find asynchronous methods of agreeing on what they have achieved together, and on how they can shape past dialogue to build shared knowledge. At the same time, they need to avoid disagreements and find a way of moving dialogue forward safely when only a subset of the group is online and able to participate.

Analysis of the dialogue of Jet, Sapphire and Pearl groups identified a set of important, and previously unobserved, discursive devices which groups of learners use to meet these requirements and construct knowledge together over short periods of time. These tools are constructive synthesis, the proposal pattern and powerful synthesis – each of which is described for the first time below. Together, they play an important role in the development of online dialogue when groups of learners are working to deadlines. These tools allow group members to contribute and combine different ideas within the dialogue. At the same time, they help the group to avoid time-consuming hold-ups due to unexpected changes of direction or interpersonal conflict. They thus support steady and safe progress, with diminished risk of missing deadlines or failing to complete assessed tasks.

5.6 Construction of shared knowledge: constructive synthesis

The first of these tools, constructive synthesis, plays an important role in the building of shared knowledge by helping to establish what is known, agreed and accepted by a group of asynchronous learners. It helps to move discussion forward by uniting ideas or information from two or more past postings, while excluding the contents of others. The selective nature of these accounts of the past is not emphasised, and their authors avoid quotation of or direct reference to the elements of past dialogue on which their synthesis is based. Instead, constructive synthesis is presented as non-controversial common knowledge and, as such, is rarely challenged. Both tutors and students use this discursive device to present their view of the past to other group members as shared knowledge rather than as interpretation or personal opinion. By being bound together and highlighted in this way, the selected aspects of the past are given weight and legitimacy for the group.

Posting 1 (Figure 2) contained two examples of constructive synthesis. The first was a reference to ‘timing difficulties’. This two-word summary was used to establish that the timing of live chat was a problem for the group. In fact, examination of earlier postings

revealed that this was a personal interpretation. Four of the seven students in Jet had agreed to the proposed time for synchronous discussion, and two had not commented. This synthesis set aside the positive statements from the majority and instead carried forward the problems outlined in two postings by one student: 'I'm HOPING to make tonight, but would it be possible to make it a bit earlier, perhaps around 9ish?' and 'Is there anyone who can make it about 8 tonight please, as any later is going to be impossible for me? Sorry as I know you have arranged to do it at 10 but I just can't do it'. Although this was a personal interpretation of past dialogue, the constructive synthesis presented it as an unproblematic reference to shared knowledge. As such, it was not challenged, and the group proceeded on the basis that these timing difficulties existed and had to be dealt with.

The second constructive synthesis in Posting 1 consisted of a selection of video clips. At this point the group was examining seven video clips and trying to decide which should form the basis for their six-week study. Until this had been decided, little else could be done. Individual students had expressed an interest in all but one of the seven clips. Kenny's constructive synthesis was based on the individual decision of its author that five of these clips could be discounted, and only the two related to Girls Talking and Dr/Patient interaction were worth mentioning by name and by number. Producing this synthesis helped to move discussion forward by helping the group to eliminate five options.

Kenny's presentation of his synthesis as value-neutral obscured its subjective element. Conference postings had actually favoured a variety of other clips relating to children and the family – the author's choice to overlook these postings and, instead, present his version of synchronous discussion on the subject neatly coincided with and prioritised his own preferences. Constructive synthesis thus served to bind together a personal selection of views put forward in the past. Linking elements from the past them in this way gave them weight and legitimacy for the group by changing their status from subjective opinion to part of the group's common knowledge.

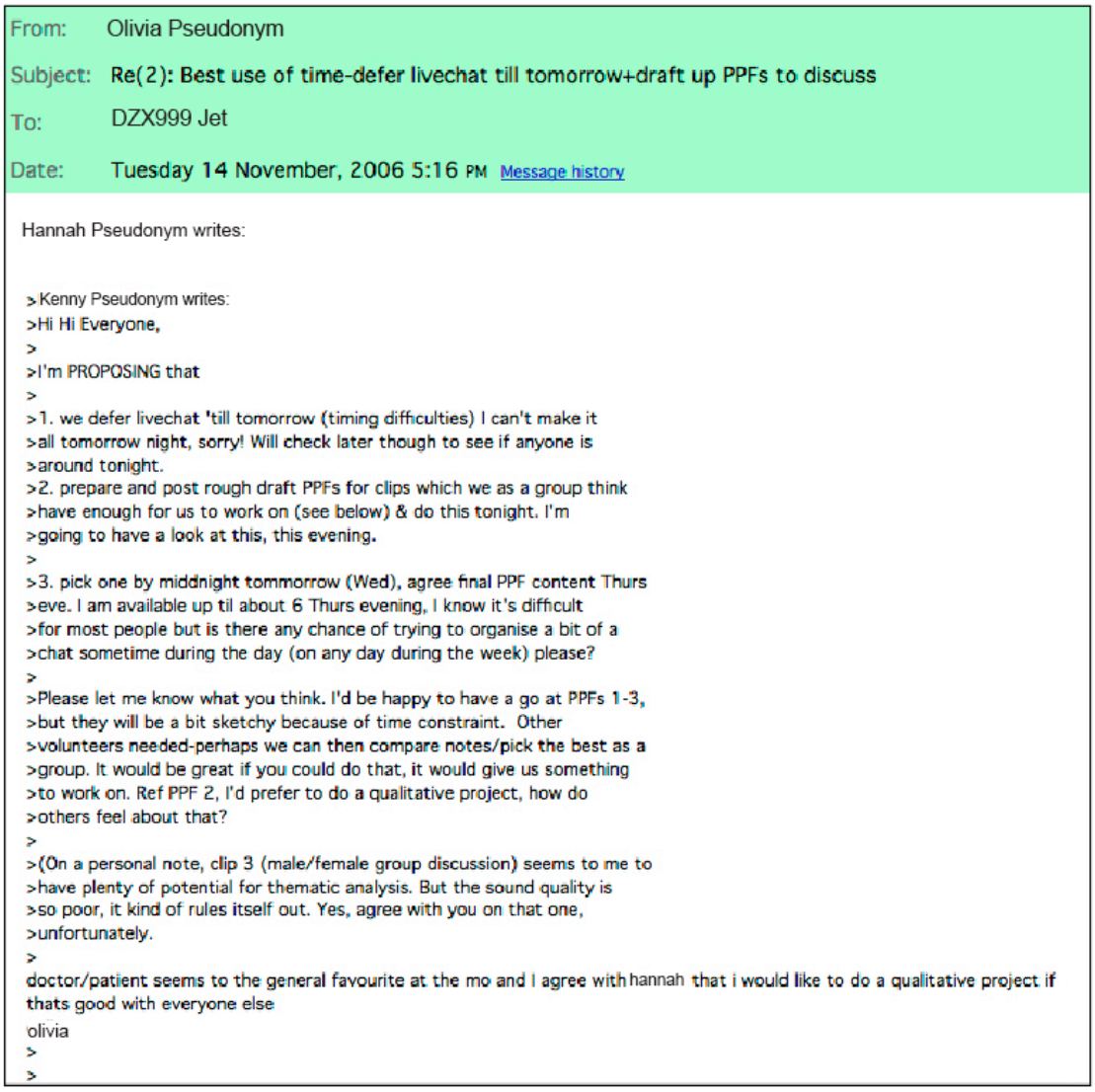
Constructive synthesis plays a part in the development of common knowledge and shared history by an asynchronous group of learners. It helps groups to mobilise the ideas presented in dialogue by producing a summary that can be used to help the group to understand what it has said and done. However, this process can have untoward or unintended results. Group members may find that their contributions are ignored, reworked, interpreted in unexpected ways or directly challenged. If they interpret any of these as a personal attack, rather than as part of the knowledge-building process, they may waste time on defensive or aggressive postings, or weaken the group by withdrawing.

Groups develop ways of minimising the emotional impact of their discussion and thus avoid such interpretations. Major decisions, such as Jet's choice of the data on which the group would base its research, are particularly difficult because the wrong choice will make future work difficult and could result in the group wasting substantial amounts of time. Decisions therefore need to be made carefully – but not too slowly, if the group is working to an assessment deadline. The risks involved for individuals and the group mean that decision-making becomes a 'delicate object'.

Like the delicate objects described by Silverman (2001), decision-making is marked as a delicate process for learners in asynchronous groups by changes in footing, by the use of hedging and by participants' use of prospective display sequences (Goffman, 1981; Maynard, 1991; Skelton, 1988b). In the Jet thread, these devices can be seen in Posting 3 (Figure 5), in the short sequence of words added by Olivia:

> doctor/patient seems to be general favourite at the mo and I agree with Hannah that I would like to do a qualitative project if that's good with everyone else.

Within this one sentence, Olivia shifted her footing from passive voice to active voice, stated her opinion in terms of what had been said by Hannah and implied rather than stated that her preference was for the video clip involving a doctor and patient.



From: Olivia Pseudonym

Subject: Re(2): Best use of time-defer livechat till tomorrow+draft up PPFs to discuss

To: DZX999 Jet

Date: Tuesday 14 November, 2006 5:16 PM Message history

Hannah Pseudonym writes:

>Kenny Pseudonym writes:
>Hi Hi Everyone,
>
>I'm PROPOSING that
>
>1. we defer livechat 'till tomorrow (timing difficulties) I can't make it
>all tomorrow night, sorry! Will check later though to see if anyone is
>around tonight.
>2. prepare and post rough draft PPFs for clips which we as a group think
>have enough for us to work on (see below) & do this tonight. I'm
>going to have a look at this, this evening.
>
>3. pick one by middnight tommorrow (Wed), agree final PPF content Thurs
>eve. I am available up til about 6 Thurs evening, I know it's difficult
>for most people but is there any chance of trying to organise a bit of a
>chat sometime during the day (on any day during the week) please?
>
>Please let me know what you think. I'd be happy to have a go at PPFs 1-3,
>but they will be a bit sketchy because of time constraint. Other
>volunteers needed-perhaps we can then compare notes/pick the best as a
>group. It would be great if you could do that, it would give us something
>to work on. Ref PPF 2, I'd prefer to do a qualitative project, how do
>others feel about that?
>
>(On a personal note, clip 3 (male/female group discussion) seems to me to
>have plenty of potential for thematic analysis. But the sound quality is
>so poor, it kind of rules itself out. Yes, agree with you on that one,
>unfortunately.
>
doctor/patient seems to the general favourite at the mo and I agree with hannah that i would like to do a qualitative project if thats good with everyone else
olivia
>
>

Figure 5: Jet thread Posting 3.

Constructive synthesis was a useful tool in this context. It helped learners in an asynchronous environment deal with decision making as a delicate object, because it altered the time frame of a proposed decision, shifting it out of the present and representing it as an established feature of the past. In this case, constructive synthesis was used as a form of prospective display sequence. Olivia's statement that 'Doctor/patient seems to be the favourite at the mo' not only elicited the opinions of others before Olivia stated her own point of view on the subject, but also shaped and interpreted those opinions.

There are close parallels between constructive synthesis and the reconstructive recaps that Mercer describes teachers using (1995, 2000). Each presents a selective account of the past that is tailored to support its author's perspective on events. However, there are differences

in the ways in which they are structured, the pedagogy they support, the problems they help to solve, and their alignment with other discursive devices. Constructive synthesis may be as short as a word or two, as in the first example above, 'timing difficulties' (Figure 2). It is rarely more than a couple of sentences in length, and it usually forms only part of a more extensive turn in the dialogue. Reconstructive recaps have the potential to be much longer, taking up one or more conversational turns. They are primarily used by teachers, and thus may be used to support a transmission mode of teaching, in which an individual leads or guides a group. Constructive synthesis, on the other hand, can be used to help any group member to transform their personal view into part of a group's shared knowledge and thus enhances a social constructivist approach to learning. Recaps are used to help learners to evaluate and build on past dialogue and events of which there may be no physical record. Constructive synthesis selects and combines elements of written material for a group of learners to take forward and develop.

Studies of classroom dialogue show that reconstructive recaps are often located at the beginning of lessons, when a teacher is establishing which past events and knowledge are relevant to current activity, and at the end of lessons, when a teacher is establishing which elements of the current activity will be important in future. Asynchronous learning is not structured in the same way; it is divided by tasks, rather than by the clock. It is a continuous, ongoing process, in which constructive synthesis is used, considered and developed repeatedly. These syntheses do not stand alone – they draw on the input of others and it is their acceptance and use by other group members that establish them as accepted elements of shared knowledge. Analysis of Jet, Sapphire and Pearl group reveals that constructive synthesis is an element in a discursive sequence that is frequently used but has not previously been identified – the proposal pattern. Repeated use of this pattern allows groups to build on and develop ideas, while limiting the potential for unproductive conflict or for sudden shifts in the group's direction.

5.7 Construction of shared knowledge: proposal pattern

The proposal pattern is a group accomplishment, completed over the course of several postings. It is often initiated by constructive synthesis and, when completed successfully, it ends with another constructive synthesis that may trigger a further use of the pattern. The proposal pattern allows groups to use, discuss and develop these summaries of what they have achieved and what they know; and thus to shape them into a basis for future activity. The pattern helps to move discussion on in an asynchronous group because within it dialogue progresses in small steps, allowing group members to participate at different times. It is a useful tool because it offers no dramatic surprises but allows a group to progress steadily. Students can therefore log out of a conference to work offline and be relatively confident that their group will not backtrack, and that constructive syntheses that have been discussed and developed will not subsequently be challenged.

The proposal pattern begins when one group member makes a proposal and immediately requests responses. Such a proposal is often presented as a three-part list, so there is no suggestion that a decision has already been made. When the proposal pattern is taken up and completed successfully, the original message is quoted, commented on and developed by one or more group members. When this has been done, a constructive synthesis is produced, without making explicit reference to the evidence on which it is based, and this synthesis is used as the basis for a new proposal. This proposal pattern occurs many times in the Jet, Pearl and Sapphire conferences and involves both students and tutors.

One proposal pattern was initiated in Posting 1 (Figure 2, above).

> 1 we defer livechat till tomorrow (timing difficulties)
>
> 2 prepare and post rough draft PPFs for clips which we as a group think have enough for us to work on (see below) and do this tonight
>
> 3 pick one by midnight tomorrow (Wed) agree final PPF content Thurs eve
>
> Please let me know what you think. (Figure 2)

The pattern began with a proposal in the form of a three-part list, which was followed by a request for comments. These proposals in the thread's first posting were taken up and discussed in the second posting, and this discussion was followed by an example of constructive synthesis at the end of Posting 3 (Figure 5, above), 'Doctor/patient seems to be general favourite at the mo'. A subsequent posting in the thread completed the pattern by initiating a new proposal pattern based on the synthesis in Posting 3. This new proposal once again took the form of a three-part list, accompanied by a request for comments:

> If we use the Dr/Patient clip we could maybe look at – interaction, power relations, negotiations between Dr/Patient, the qualitative way would be good for this, what does everyone else think?

In both cases, the proposal pattern functioned as a method of carrying ideas from the individual to the group domain. Constructive synthesis was an important element in this process. The proposal pattern allowed learners to present options to the group and then to step back, leaving their ideas to be reworked and combined with related ideas by other group members – emerging in the form of a constructive synthesis, which then triggered action and discussion.

Constructive synthesis and the proposal pattern were not constant features of groups' dialogue. During the first week of the Pearl conference, group members posted 72 messages. This compared favourably to the level of activity in Sapphire group, where 52 messages were posted during this period. However, although all members of Pearl group appeared to be involved, the number of messages posted obscured the fact that only two students were moving the project forward. Of the other two students in the group, one was posting about personal and technical problems, while the many contributions by the other student consisted mainly of references to unread articles. A signal that the group was not building knowledge together was that members' dialogue during the week contained neither completed proposal patterns nor constructive synthesis. The absence of

constructive synthesis can therefore be seen as a sign of trouble, an indication that learners are not constructing common knowledge and a shared history.

An advantage of constructive synthesis for asynchronous learners is that it supports the steady construction of shared knowledge by helping groups to reach agreement gradually. Constructive synthesis is rarely challenged, because it builds on what has gone before and is presented as uncontroversial and previously agreed. Although individuals occasionally challenge proposed plans for the future, or ask for clarification of what has been posted, what typically happens is that accounts of the past are accepted. Any direct challenge forces an asynchronous group of learners to change its method of working, because gradual progress is no longer appropriate. In order to proceed confidently, a group must then find a method of quickly agreeing whether to base future work on the original constructive synthesis or whether to change direction.

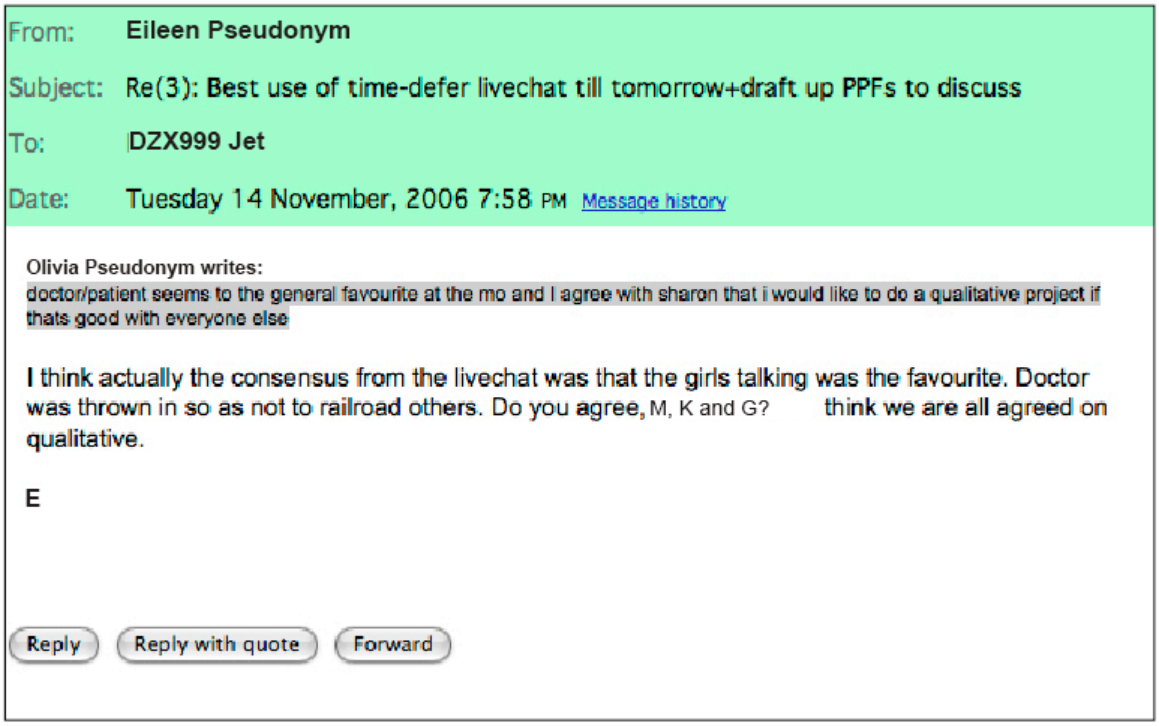


Figure 6: Jet thread Posting 5.

Although direct challenge is very unusual, there is an example in Posting 5 (Figure 6) of the Jet threaded discussion. At this point in the threaded discussion, experience of previous

dialogue suggested that the next posting would continue the proposal pattern by quoting and commenting on the synthesis and proposal in the previous postings, and that the dialogue would continue in an orderly fashion. Instead, in Posting 5, Eileen offered a direct challenge to Olivia's statement in Posting 3 (Figure 5, above) that 'doctor/patient seems to be the general favourite at the mo' by contesting her version of the past:

> I think actually the consensus from the livechat was that the girls talking was the favourite. Doctor was thrown in so as not to railroad the others. Do you agree, M, K and G?

Eileen's challenge posed a significant problem for Jet group. Members had to decide between the original constructive synthesis quoted by Eileen in shaded text, which was based on previous postings and oriented the group towards work on the Dr/Patient video clip, and the challenge, which was based on synchronous discussion and favoured the Girls Talking video clip. Group members quickly had to find a way of choosing between these contested accounts of the past because they could not afford to spend too long on this matter. Anyone logging off to work at this point was likely to be wasting time. It was impossible to proceed on the basis of a constructive synthesis that presented a disputed version of group history and the group had to pick its way backwards to a point at which members were clear on what they had done and on what they had agreed.

One way for an asynchronous group to proceed at this point would be to move from asynchronous to synchronous discussion. A livechat facility, such as the one provided by FirstClass software, helps here; but most asynchronous conferences can be used synchronously if necessary. At various times Jet, Sapphire and Pearl groups all interacted synchronously, either through the livechat facility or, more rarely, by holding synchronous discussions through conference postings. Under certain conditions – for example, when members of a small group are all online for a reason such as an impending deadline – such

discussions can be arranged with little notice. However larger groups, or groups that are aware of no pressing need to be online, have to make arrangements well in advance.

Another possible way forward is for one group member to take a leadership role and choose between different accounts of the past. For a student to take on such a role in a collaborative group would involve significant shifts in the dynamics of the group and imply that individual members had different levels of responsibility. Tutors in Jet, Sapphire and Pearl conferences therefore discouraged students from dealing with challenges in this way. When interviewed, the tutor of Sapphire wrote that a

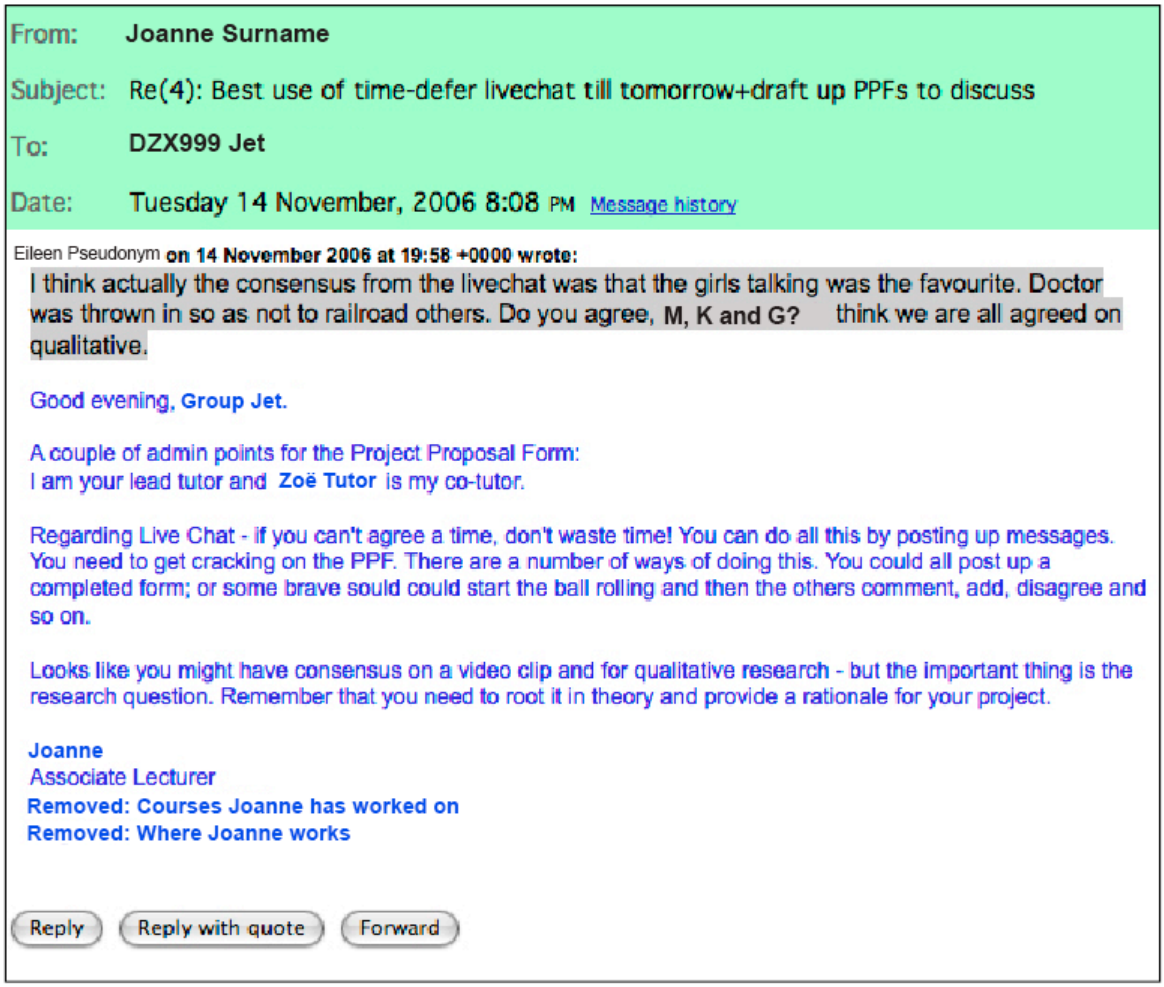
> tutor needs to ensure democratic and encouraged contributions from all to secure a solid way forward. This helps prevent lack of understanding and fall out from course.

Either a move to synchronous discussion or the appointment of a leader could be a useful strategy if a group has previously been organised to make decisions in this way. However, neither is appropriate on a primarily asynchronous course on which tutors are concerned to facilitate understanding by encouraging contributions from all. An asynchronous group of learners operating within these constraints has to find another route forward. In the case of Jet, Sapphire and Pearl, they did this by mobilising the input of a tutor in order to develop constructive synthesis into powerful synthesis.

5.8 Construction of shared knowledge: powerful synthesis

Like constructive synthesis, and the proposal pattern, powerful synthesis has not previously been identified or described in the existing research literature. Also like constructive synthesis, it unites and adds weight to ideas from past postings, while excluding others and making no direct reference to sources. However, when such a summary is employed by a tutor and when it meshes with the current needs of the group, it can be transformed into a different discursive device, powerful synthesis, which has more

force and which a group can use to drive future dialogue. This synthesis makes use of the shared expectation that tutors have power and a leadership role in educational settings. Even when tutors do not actively take up this role, students can assign it to them, as is the case with the proposal pattern.


From: **Joanne Surname**

Subject: Re(4): Best use of time-defer livechat till tomorrow+draft up PPFs to discuss

To: **DZX999 Jet**

Date: Tuesday 14 November, 2006 8:08 PM Message history

Eileen Pseudonym **on 14 November 2006 at 19:58 +0000 wrote:**

I think actually the consensus from the livechat was that the girls talking was the favourite. Doctor was thrown in so as not to railroad others. Do you agree, M, K and G? think we are all agreed on qualitative.

Good evening, **Group Jet.**

A couple of admin points for the Project Proposal Form:
I am your lead tutor and **Zoë Tutor** is my co-tutor.

Regarding Live Chat - if you can't agree a time, don't waste time! You can do all this by posting up messages. You need to get cracking on the PPF. There are a number of ways of doing this. You could all post up a completed form; or some brave sould could start the ball rolling and then the others comment, add, disagree and so on.

Looks like you might have consensus on a video clip and for qualitative research - but the important thing is the research question. Remember that you need to root it in theory and provide a rationale for your project.

Joanne
Associate Lecturer
Removed: Courses Joanne has worked on
Removed: Where Joanne works

Reply | Reply with quote | Forward

Figure 7: Jet thread Posting 7. Posted by tutor.

An example of this occurred in the Jet threaded discussion considered in this chapter, as group members used synthesis by a tutor to help them make a rapid choice between contested versions of the past. Before Posting 7 (Figure 7), group members were unclear whether they had decided to base their future work on the Girls Talking video clip, or whether they had agreed that they would prefer to work with the Dr/Patient video clip. The tutor's input in Posting 7 was mobilised by group members to help them decide between

versions of the past. After this posting, no further arguments were put forward about choice of data and all members of Jet acted on the basis that they would be basing their research on the Girls Talking video clip.

In Posting 7, tutor Joanna stated that the group might have 'consensus on a video clip'. She did not specify which account of the past she preferred – but she quoted Eileen, who wrote that 'girls talking was the favourite'. The students took this as a decision in favour of the Girls Talking video clip. It was not the tutor's words but the group's use of those words that transformed them from constructive synthesis to powerful synthesis and thus allowed the group to choose between contested versions of the past.

In this case, powerful synthesis was employed to move the group forward. In the early stages of Jet's threaded discussion, it seemed clear the group had implicitly decided to study the Dr/Patient video clip. However, after the challenge in Posting 5 (Figure 6, above) was followed by the tutor's powerful synthesis in Posting 7 (Figure 7, above), group members acted on the assumption that they had decided to use the video clip of Girls Talking. They did this despite the available evidence in the conference archive, which supported Olivia's constructive synthesis in favour of the Dr/Patient clip rather than Eileen's later assertion that the Girls Talking clip was the real favourite. The Dr/Patient clip had been discussed favourably in numerous postings, while there was only one positive reference to the Girls Talking clip. However, the powerful synthesis authored by the tutor and mobilised by the group enabled the challenge to prevail. Future discussion proceeded on the basis that the Girls Talking clip had been selected.

Like the discursive devices, such as recap, which Mercer showed are used by teachers to move ideas forward in face-to-face classrooms, powerful synthesis uses a tutor's description of the past to construct the group's history. Unlike those devices, which take their power from the tutor's role in an instructor-led setting, powerful synthesis is a group

accomplishment. Although this form of synthesis draws on students' assumptions that the tutor has power, that power is assigned by the group rather than claimed by the tutor. Group members make use of tutors' syntheses to move discussion forward quickly. In Posting 7 (Figure 7, above), the tutor's synthesis was far from dogmatic: it was ambiguous, open to interpretation and certainly open to challenge. However, it suited group members to avoid conflict and to move on as quickly as possible; they therefore assigned particular power to this synthesis.

The same thing happened in Sapphire conference; the group assigned power to a synthesis produced by the tutor. One student listed a variety of approaches the group could take to its research. The tutor responded with the comment: 'Some interesting ideas… I often think the best advice to the group is to keep it simple and straightforward.' This synthesis, like that in Posting 7, was ambiguous; it was not clear whether the tutor was talking about just one of the student's proposals or all of them. However, at this point the group was approaching a deadline and needed a way of avoiding the time-consuming work involved in deciding between a range of theories and a series of detailed proposals. The next student posting proposed a very easy experiment, similar to one they had all performed before, and group members used the tutor's words to justify their selection of this simple alternative. It is unlikely that the tutor's intention was to encourage the group to repeat previous work, but group members mobilised his synthesis to enable them to adopt this option.

Powerful synthesis, constructive synthesis and the proposal pattern have the advantages for asynchronous learners that they support the steady and safe construction of knowledge without wasting time on sudden changes of direction or on interpersonal conflict that could prevent the group from missing an important deadline. The asynchronous dialogue in Jet, Pearl and Sapphire thus had the characteristics of cumulative dialogue. Group members constructed shared knowledge by building on each other's contributions and adding their own information, without challenging or criticising each other's views. Learners in Jet

were thus able to agree on the data they would analyse, but they avoided any detailed exploration of why individuals were proposing different video clips, and any contested version of events was dealt with through synthesis, rather than through challenge and explanation. Similarly, in Sapphire, learners used powerful synthesis to allow them to circumvent the need to explore different research proposals.

In the first week of these conferences there was no evidence of disputational dialogue. Disagreement was avoided where possible and, when it did occur, was quickly dealt with by use of powerful synthesis. At the same time, there was no evidence of exploratory dialogue. The proposal pattern includes requests for views and comments, and such requests can be indicators of exploratory dialogue, but these requests were not followed by challenges, explanations or justifications. Analysis showed that the groups made virtually no use of disagreement. They neither engaged in unproductive disputes, nor did they engage in productive challenges. Instead they engaged in purely cumulative dialogue that allowed them to construct knowledge together and thus meet their first deadline.

5.9 Co-construction of knowledge over short periods of time

In addressing the question ‘How do groups of learners construct shared knowledge by building links across postings in asynchronous dialogue?’ this chapter has shown that this type of dialogue presents a series of challenges to groups of learners. Because they are rarely or never online together and have very different work patterns, dialogue proceeds slowly and postings must be linked in ways that avoid unproductive conflict, do not extend the dialogue unnecessarily and facilitate steady progress with no sudden surprises.

Learners work to establish adjacency between postings by the use of threading and of cohesive ties. They also use posting layout features to structure debate, prioritise contributions and carry ideas forward in ways that would not be possible when using a non-textual medium. They make repeated use of constructive synthesis, proposal patterns

and powerful synthesis to build shared knowledge together through their dialogue. When they do not do this, it is an indication that group members are not working together. Each of the groups that were studied submitted a research proposal after a week. However, in the case of Pearl group, analysis of their dialogue patterns showed that the group was not building knowledge together, but was simply approving the work of individuals

The cumulative dialogue engaged in by learners resulted in steady progress and effective construction of common knowledge, but avoided the challenges, counter-challenges and explanations that are important features of exploratory dialogue. Analysis suggested that asynchronous dialogue may encourage learners to engage in cumulative rather than exploratory or disputational dialogue if they are working to deadlines. However, the literature suggests that the ability and willingness of groups of learners to employ different forms of exploratory dialogue are not inherent in the medium or in the individuals, but are tied to social and temporal considerations (Mercer, 2008; Mercer & Littleton, 2007; Wegerif, 1998). Although Littleton and Whitelock (2005) found that online learners' dialogue was mainly cumulative, their study focused on students who were required to engage in discussion, but were not required to reach a consensus. The tendency to use cumulative dialogue may therefore have been related to the task rather than to the medium.

Because this chapter has been concerned with the co-construction of knowledge over short periods of time, it has focused on data drawn from the first week of three six-week project group conferences. During this week, all three groups were concerned to meet an important deadline and this acted both as a constraint on their interaction, and as a spur encouraging them to engage in productive interaction. Also during this week, they were involved in relationship building, in learning to work together as a group, and in understanding other group members.

Chapters 6 and 7 go on to consider data covering longer periods of time. The social setting is also different from that of the first week of group work, in that the groups of learners are more established and their members have experience of working together online. These chapters investigate whether social and temporal context influence the type of dialogue in which members engage. They also investigate whether the cumulative dialogue promoted by impending deadlines, a newly formed group and irregular patterns of interaction continues to predominate as learners' contexts changes.

6 Negotiation and avoidance of unproductive interaction

Chapter 5 began to address the main research question 'How do groups of learners use asynchronous dialogue to build shared knowledge over time?' by considering how groups of learners build links across postings to construct shared knowledge. This focus on the short term indicated a cumulative approach to knowledge construction on the part of online groups of learners. Their dialogue did not only address the tasks the group had been set; members also shared some personal information about themselves, often through introductory postings. Although team building was not a learning objective, learners' joint construction of common knowledge, shared vocabulary and a mutually agreed history meant that they were able to work together as groups rather than as individuals.

In order to build shared understanding, they needed to develop a shared context in which individuals were concerned to work together rather than in opposition, in which they could both work together confidently and perceive clear benefits to working together. This chapter is concerned with what happens when tensions arise that could limit or prevent the co-construction of knowledge. It therefore addresses the question

- How do groups of learners, working together in asynchronous environments, negotiate and attempt to avoid unproductive interaction?

Unproductive interaction is taken to be interaction that does little or nothing to support the construction of knowledge or social understandings. It may create confusion or tension

within a group. Disagreement and conflict are used negatively, to stress differences between individuals, and silences are used to express lack of interest, lack of engagement or even hostility. This form of interaction is associated with the assertions and counter-assertions of disputational dialogue.

Unproductive interaction can be contrasted with productive interaction, which was defined in Section 2.7 as interaction 'that helps the group to extend its understanding and to achieve its goals' Productive interaction is implicated in the shared construction of knowledge, not only knowledge related to the task in hand, but also to the construction of shared understandings and contexts that allow learners to work together effectively as a group. It may involve disagreement and conflict, but these are employed to develop understanding. Such interactions utilise cumulative and exploratory forms of dialogue and may include contemplative silences. Both types of interaction are linked to socio-affective conditions and to learners' understanding of the group's context, resources and the task on which they are working together.

In order to answer the research question, asynchronous conference group interactions were analysed over the six-week active life of the group. This analysis focused on whether groups continued to engage in cumulative dialogue as they had done at first or if, as their temporal and social context changed, tensions became apparent and they began to engage in unproductive interaction and disputational dialogue. Although little evidence of either of these was obvious in conference postings, thematic analysis of interviews with learners and tutors revealed significant sources of tension within the groups: silences, the difficulties involved in making decisions and feelings of being excluded. These themes were used to guide analysis in order to identify the ways in which groups of learners either negotiated or tried to avoid unproductive interaction as they worked to build knowledge together.

6.1 Data set

Two types of data are considered in this chapter: the asynchronous conference dialogue engaged in by learners in the Jet, Sapphire and Pearl project groups, and epistolary interview data. While analysis in Chapter 5 focused on the first week of these conferences, analysis here deals with data from all three groups throughout their six-week active life. This extensive data set was selected in order to observe changes in the groups' interaction as their temporal and social context changed. These changes were expected to be partly due to the development of the group over several weeks, as members grew more familiar with each other and with online group work, and partly due to the demands placed on the group by the deadlines in their course timetable.

All three groups had to meet two important deadlines. The first required them to submit a jointly developed project proposal form after working together for a week. The second, five weeks later, required each group to present an account of their finished research project to other students on the course. Periods of stress could therefore be expected after learners had been working together for a few days and the group was only just forming, and after they had been working together for several weeks and relationships and working patterns were well established. Between those times, the course timetable put less pressure on the project groups.

In order to make the research more dependable, data from all three groups was analysed so that interactions in all three groups over time could be compared and contrasted. As stated in Section 4.1, Pearl and Jet groups, like most others, had two tutors. Sapphire group had only one full-time tutor, who had to deal single-handedly with a conference that was open 24 hours a day, seven days a week for six weeks.

Analysis of conference postings was supplemented by evidence from epistolary interviews with 16 students and five tutors on the course. These included five members of Jet,

Sapphire and Pearl: Maggie (Jet student), Olivia (Jet student), Teresa (Sapphire student), Joanna (Pearl and Jet tutor) and Philip (Sapphire tutor). In the analysis below, all those interviewed are referred to by pseudonyms. When quotations are given, they are from students unless otherwise stated.

The epistolary interviews extended the data set over time because the tutors had worked with other project groups in previous years as well as in several project groups on the 2006 course presentation. The data set was also extended because the interviews drew on the experience of a wide range of groups, including groups whose conference interaction was not accessible. In the case of students and tutors from Jet, Pearl and Sapphire groups, the interviews revealed features of the interaction that were not apparent in the conference data. For example, Olivia from Jet group reported that 'a couple of us felt lost and overwhelmed with the work load', which was not clear from the conference data. Maggie, who was also from Jet group, gave a personal perspective on the affective aspects of group interaction: 'I feel guilty if I have not logged on in say two days and then there has been a lot of work done over those two days and I feel I have not contributed and feel left out.' Again, these feelings of guilt and exclusion were not apparent in the conference data.

6.2 Thematic analysis

Thematic analysis (see Section 4.8) of the interviews indicated important themes that were not clearly evident in the conference data: the significance of silence in the conferences, the problems associated with decision making and concerns about being ignored and excluded. These were mentioned many times in the interviews, establishing that silence was used and interpreted in many different ways by group members, and that they had a variety of concerns about the ways in which decisions had been made, and the consequences of those decisions. These themes are dealt with in this section. Other themes

relating to sources of tension in asynchronous learning environments were also evident in the conference data, and these themes are dealt with in subsequent sections.

6.2.1 Silence within the conferences

Student Arlene summarised some of the concerns about silence when she wrote:

> I think it was difficult to give much time to group dynamics because we were in the group to perform a function and had to get on with it, voicing our frustrations wouldn't have helped the task at hand and we were all aware of it. Several group members 'vanished' for a week at a time – everyone just put up with this, nothing was said. At other times we had agreed to meet for 'live chat' and no one turned up.

The first issue raised was silence as a strategy. Students reported that individuals used silence to deal with tensions within the group by masking themselves or their feelings. One student, Bernie, commented, 'I don't think that letting the others know about my feelings would have helped much.' Another student, Ike, associated the strategy of silence with the affordances of online work: 'when communicating online you are more able to lie and hold things back like your feelings, your knowledge or not knowledge about issues that are of concern'. Maggie and Vernon's explanations of their silence were more personal. Maggie related her strategic silences to self-presentation, 'I did not want to come across as "asking stupid questions"', whereas Vernon was concerned about the feelings of others, 'there is always the straitjacket of not wanting to offend anyone.'

The second issue raised by Arlene was the unexplained or unexpected silence of other group members. Although she was not overtly critical, her use of the phrase 'put up with' suggested that she interpreted such silences negatively. Teresa, from Sapphire group, was more outspoken, 'Members of the group didn't answer their emails that I'd sent and I was quite annoyed when the excuses came in as we were meant to be working together as a team and I felt very much alone'. On the other hand, Olivia, a student in Jet group, reported feeling guilty and left out when others got on with the work without her.

Ike raised a third issue, silences that appeared to exclude group members.

> What I would consider as a problem in my group work was that some members of my group were informally forming some kind of subgroups by being in touch and discussing issues of the project and taking decisions outside the group's prearranged timetable, on behalf of the group.

Similar silences were mentioned by Olivia, from Jet group, 'When a key topic needed to be decided participants were able to pick and choose whose message they answered and whose was disregarded by simply ignoring their contribution.' Student Rachel felt very strongly about this and returned to it many times in her interview: 'I was ignored and excluded, the thing about talking on the internet it that you can be totally ignored, it is not like you are looking into someone's eyes as you pass over their comments.'

6.2.2 Decision making within the conferences

Concerns about being ignored and excluded were related to concerns about decision-making within the groups. When students were not involved in the decision-making process they felt excluded, and were unhappy with aspects of the resulting projects.

Tutor Renée described a group in which the task-based focus of individuals limited the effectiveness of the group

> the dominant pair were not happy to compromise on their research decisions. After some initial suggestions the quieter members of the group stopped contributing and even the bright student gave way to the weak student almost had it all her way until the tutor intervened.

Ike felt that decisions were made by a sub group and, in Jet, Maggie's view was that 'in the end, the three main guys tended to converse with themselves and the rest of us tried to contribute when we logged on, but I did feel on the outside of it sometimes.' As in the pilot study, the social concerns of the group were at odds with the task-based focus of the individual. Although the students in Ike's sub-groups and the 'main guys' in Jet appear to

have been engaged and focused on the assessed task, their engagement had a negative impact on the social dynamics of the group as a whole.

Students linked the formation of sub-groups and the consequent exclusion of some individuals to temporal concerns. Those who had the time to engage with the discussion at key points were able to take a more dominant role in their group. Vernon's view was that 'if you are (unavoidably) 2 or 3 days late in joining a crucial juncture of the discussion, then your ideas will probably be rejected'. Arlene reported that 'there was a fair amount of pushy group dynamics going on, which there was no time to address because of the pressure of the work deadlines.'

Students believed that temporal issues not only limited discussion, they also led to unsatisfactory decisions being made and a consequent weakening of the research project. Rachel felt that there 'was no time to resolve differences in understanding and I felt excluded from the process ending up with a project was unable to write up with any sense of ownership as I could not understand why they had chosen to do it so.' In Bernie's opinion, 'online projects need more time, we don't talk to each other at the same time and very often one accepts less convincing ideas just to get it over with.'

Methods of making decisions were also seen to have negative effects on both the groups and their projects. Ike was clear that 'decision-making should be on a scientific basis rather than guided by time restrictions' but, according to Arlene, this was not always the case: 'The compromise we agreed possibly compromised the validity of our experiment, but we reached one nonetheless.' She later added: 'We voted in the end. Not everyone was happy.' Course deadlines put pressure on students to compromise more quickly than they would have liked, but so did their personal timetables. Eryn's group 'had to work with each other's deadlines and so compromise more'.

These themes that emerged from the interviews were neither immediately apparent in the conferences nor strongly suggested by the literature. They were used as ways of approaching the conference data and as indications of where sources of tension would be located and where unproductive interaction might be found.

6.3 Unproductive interaction

The conference postings of Jet, Pearl and Sapphire over six weeks showed that the dialogue, like that of the first week, continued to be predominantly cumulative. All the conference evidence showed learners building on each other's views without criticising or challenging them. However, interviews with tutors, who had access to several student groups each year, indicated that this was not always the case and that some groups of learners did engage in disputational dialogue through flaming, the exchange of postings containing hostile message content.

Philip, an experienced tutor, commented when interviewed that 'flame wars are not common but need quick intervention to stop them erupting'. His description of flame wars included elements of disputational dialogue: disagreement, assertions, counter assertions and few attempts to pool resources, and his characterisation of these exchanges as a 'war' linked them to the insults, threats and fights observed by Wegerif, Mercer and Dawes (1998). When asked to expand on this comment, he wrote:

> At least two of the group were very knowledgeable and I think scared or confused some of the others quoting theories and wanting their own way to be accepted. This is where a bit of argument developed (flame war) and it had to be defused without people losing face.

Philip made clear links between this type of dialogue and affective concerns; participants were 'scared', 'confused' and worried about losing face. Other tutors made similar connections. Disputational dialogue was linked to the feelings of individual learners and

also to their position within the group. When interviewed, tutor Renée described a project group from a past presentation of the course that had experienced problems.

> The group I am thinking of had most trouble because of strong views from 3 members of the group on what should be done and how it should be done. They really bickered in the email discussions and one tended to go away and sulk for a while. So, strong personalities and strong opinions in conflict. Very different styles of communication and attitudes to how to get the job done. Resistance to giving in to another group member. They were all male and two of them wanted to be 'leader' – the third was a bit of a 'hippy' and got everyone's backs up with irritating ways of communication e.g. highly abbreviated and colloquial – writing as young people might text one another. The conflicts had a knock-on effect in that the other members of the group became confused, frustrated, and disheartened.

In the absence of social information, personal judgments about these issues were based on interpretations of textual style and thus text-style chat was linked with 'being a hippy', while the expression of strong views and strong opinions was associated with the desire to lead. Renée's description encompassed disputational dialogue and its socio-affective aspects, and indicated the negative effects of this form of dialogue. In this case, not only did group members become confused, frustrated and disheartened, but also 'the quieter members of the group stopped contributing and even the bright student gave way'.

In order to find examples of groups experiencing difficulties in working together, tutors drew on their experience of many groups over several years. Data from Jet, Pearl and Sapphire conferences do not reveal similar problem, and show no evidence of disputational dialogue. The tone of postings was overwhelmingly courteous, with liberal use of terms such as 'please' and 'thank you'. Members of Jet group, for example, thanked each other 192 times in their 618 postings, members of Sapphire did so 73 times in 196 postings, and members of Pearl did so 57 times in 300 postings.

When interviewed, student Vernon commented that 'people took great pains to be polite to one another when expressing dissent. They were also highly complimentary and grateful to

pieces of work done by others.' Vernon's view was confirmed by the conference data, in which students appeared to be models of politeness: asking each other's opinion, quoting each other approvingly, complimenting each other and deferring to each other.

Yet interview data highlighted that these polite exchanges in the conferences concealed significant underlying tensions. Interviews with members of Jet, Pearl and Sapphire were particularly useful in this context because they cast the conference data in a different light, revealing concerns about silence and about decision making. Interviews with Jet group students Maggie and Olivia revealed frustrations in these areas, although these frustrations were not clearly apparent in Jet group's conference postings.

6.4 Sources of tension in asynchronous learning environments

The use of asynchronous dialogue makes group decision-making difficult because group members rarely interact at the same time. As Section 5.2 showed, although individual students and tutors may spend only minutes considering a sequence of messages, it will be more than 24 hours before members of a large group can expect that all members will have considered them. This slow pace of discussion means that group decision-making is necessarily a protracted process. Even a proposal that is readily accepted by everyone will not be agreed for several hours. A disagreement could take days to resolve.

An additional problem identified in Section 5.2 is that, due to the differing participation patterns of students, any significant change in a group's direction has the potential to be a serious problem for those who check the conference once a day rather than logging in regularly. Students' offline work builds on the decisions that have already been taken online and on those that seem likely to be taken in future. If unexpected decisions are made after individuals have logged out, they may waste hours on tasks that are no longer required. These temporal challenges of decision making mean that, if members are to avoid fruitless labour and to meet deadlines, groups need to avoid unproductive and time-wasting

disputational dialogue as well as interpersonal conflict. It is also important for group members that discussion progresses both smoothly and predictably.

Making decisions in ways that avoid changes in group direction or the expression of conflicting ideas can lead to resentment among group members, despite the associated advantages. This way of working also has the potential to limit the value of students' work and limit their understanding. Ten of the 16 students interviewed expressed dissatisfaction with the decision-making processes adopted by their group. One source of dissatisfaction was the impression that particular individuals were excluded and their opinions ignored.

Jet student Maggie observed that 'when a key topic needed to be decided, participants were able to pick and choose whose message they answered and whose was disregarded by simply ignoring their contribution.' Judging when a contribution to asynchronous dialogue has been disregarded or ignored is not easy. In a face-to-face environment a look, a nod or a sound such as 'Uh-huh' are back-channel methods employed by individuals to acknowledge the contributions of others. Online, these methods may be replaced by the use of emoticons, a replacement that is more likely when, unlike FirstClass, software supports their use. In FirstClass the main back channel for judging response is the message history; any group member can check the message history of a posting and see who has opened it, and when they did so.

This requires work from the initiator, rather than from the respondent, and complicates the exchange by requiring a conscious check rather than the near-automatic registration of feedback through face-to-face back channels. In addition, this is not a commonly used feature. Sapphire student Teresa felt her contributions were ignored and, when asked in an interview about her use of message histories, she commented:

> Do you know I didn't know anything about that history button, I can just about get by on computers but I don't know all the ins and out. If only you had been there then to tell me that! I didn't realise that could be done, I didn't know how to access it.

Although Jet student Maggie felt that contributions to her conference were ignored by some people, message histories indicated that this was a misleading impression because, in most cases, group members opened all postings. Without easily accessible back channels for communication, disruption to adjacency pairs suggested that contributions were being ignored when this was not the case. Nevertheless, group members expected an explicit response to their considered input and, as in a face-to-face environment, perceived that something was wrong if they did not receive such a response.

Non-completion of adjacency pairs is a frequent occurrence online. Contributions to the social talk that would be expected to generate prompt responses in face-to-face contexts can be temporarily overlooked or completely ignored in asynchronous dialogue. There were many times within Jet, Pearl and Sapphire conferences when adjacency pairs were not completed, and references to social and affective issues were particularly unlikely to be taken up. References by students to heavy workloads, to sickness or even to chronic long-term illness that would have provoked a near-automatic response in face-to-face conversation were left hanging while the groups continued with their project work.

In the case of Jet group, tutor Zoë produced a detailed and interesting personal introduction, including the information that 'I will spend 2007 nurturing the latest edition to my brood (due early March).' In the subsequent student introductions, Maggie revealed that she was also pregnant: 'As I write I have a little fluttering in my tummy :-) .... somebody is awake...I am 23 weeks pregnant which I am very excited about. I am due on the 5th of March'. In the case of groups of adults working together in a face-to-face environment, the revelation of pregnancy could be expected to provoke some reaction. It would be highly unusual for two women in a small group, finding themselves to be at the same stage of pregnancy, not to make some reference to it. For Maggie and Zoë to state that they are pregnant thus evidently formed the first part of an adjacency pair in both

cases. However, neither announcement provoked a reaction of any kind. Despite the fact that Zoë opened Maggie's posting, the adjacency pairs remained incomplete.

In face-to-face conversation the lack of the second half of an adjacency pair is an indication of trouble, for it suggests that the first half was inappropriate or that one or more participants has misread the situation. In the conferences, the lack of response to social information therefore acted as a strong signal that this was not an appropriate topic of conversation – and the lack of response thus informed participants' future behaviour, as is demonstrated below.

This interpretation of the dialogue may have been linked to an underlying assumption that the adjacency pair transfers directly from spoken to textual dialogue. If so, this was a false assumption on the part of group members, as communication does not proceed in the same fashion in the two environments. Group members were not necessarily aware, as they would have been face to face, that no one had responded to a direct question. A remark about health or personal difficulties or even pregnancy, which would have required an immediate acknowledgement in speech, may have seemed irrelevant to someone reading it hours or days later. Group members may also have found it awkward to produce a delayed response to these contributions. The breaking of adjacency pairs was therefore not necessarily a sign of trouble in the dialogue, although it was sometimes interpreted as such.

Lack of back-channel communication, together with non-communication of adjacency pairs, left group members with the impression that contributions to debate were sometimes completely ignored and that decision-making was thus weighted in favour of certain individuals whose contributions provoked response. Another problem with decision-making was linked to groups' use of cumulative dialogue to make steady progress without exploring alternative options in detail. When interviewed, student Arnie noted that this could limit the value of research developed in this way:

> There was a problem with deciding on the focus of the project. It was resolved by simple discussion/argument, with minor advice from our group tutor, and a compromise reached. The compromise we agreed possibly compromised the validity of our experiment, but we reached one nonetheless.

Another serious criticism of this method of decision-making was that it limited some students' understanding of what they were doing. Student Rachel felt that 'there was no time to resolve differences in understanding […] I was ignored and excluded.' Once again there was a reference to being ignored – to the perception that a lack of expressed reaction implied not only a negative response to the posting but also a negative response to its author, and that these missing reactions had the effect of excluding members from the group. Steady and gradual decision making through cumulative dialogue thus had the unwanted side effects that some students believed they were being ignored and excluded and some lacked understanding and ownership of the group's decisions.

Issues related to decision making were a major source of tension for students. Another was time keeping. The majority of students interviewed chose to work together online because of constraints imposed by family, work, location or health. In most cases, these constraints had implications for their patterns of study. Some students were working in different time zones, some were only physically able to study for short sessions, were caring for older or younger relatives, were holding down several jobs, or often had to travel abroad at short notice. The length of the course meant that most of them had to timetable in family holidays, festivals or more significant events such as moving house or giving birth. As a result, despite the apparent 'any time' affordance of asynchronous technology, 14 of the 16 students interviewed mentioned time-related problems with the course.

Despite the lack of disputational dialogue in their conference, both Jet students interviewed were clear that timetabling had been a contested issue for the group. Maggie found that her personal commitments did not sit easily with the demands of group work, and wrote:

> I like to work at my own pace, whereas the weekly deadlines for the first part of this course was during the week on an evening. I fit coursework between work (at that stage I was not yet on maternity leave) and other things too, for example I have Orchestra on Tuesday evenings which clashed with every deadline, meaning I had to work ahead (and I am famous for leaving work till the last minute and burning the midnight oil). Many of the chats that were organised during the group work did not suit everyone in the group as everyone was free at different times.

All students on this course had previous experience of distance education, having completed at least one other Open University course. They thus, like Maggie, had established patterns of study, structured around work, family, outside commitments and personal preferences. Online group work required them to align individual study patterns with those of the group, a process that they found very difficult. When study patterns remained unaligned, this could give a false impression about the participation levels and commitment of individuals. When interviewed, Jet group student Olivia argued that her personal schedule limited her participation in discussions, giving a misleading impression.

> I logged on at night or in the early hours and found I had often missed something which had come up and had already been solved so was very aware that I didn't appear to be pulling my weight and a couple of us felt like that.

Personal details shared by Jet group members in their introductory emails made it clear that timetabling was likely to be a problem for the group, but these introductory emails also potentially provided sufficient detail for students to organise work schedules around the commitments of others. Hannah reported that 'I log on mainly during the day as most evenings are difficult for me.' Glenn was thus unlikely to coincide with her because 'my working hours and family life tend to mean I get online either really early (6.00am) or late (after 9.00pm).' However, he was likely to be online at the same time as Olivia, who had: 'a cleaning firm, which I look after on a weekend so my hours can be erratic. I usually log on before 8am or after 9pm, but it could be any time in the early hours on a weekend.'

Glenn was also likely to be studying at the same time as Heather, as both worked full time. Kenny was more flexible, 'I am lucky in that I am able to log in virtually anytime except from 6-8 pm. I don't tend to do anything in the early hours of the morning though!' Maggie's schedule varied throughout the week, she worked 'best on the weekends, or late evenings, (Tuesday evenings I have orchestra). I cannot log on during work (bank policy), and I have to say with all the previous exercises due on a Thursday night (as I would be working on a Friday morning) have been quite difficult to meet. I do have Mondays free so I do have those too.' Eileen's schedule also varied throughout the week, 'Thursdays and Fridays school hours are my study days'.

These were the group's complex ongoing time constraints, excluding events such as work trips and holidays and unpredictable but time-consuming events such as illness of family members. The course's Study and Assessment Guide stated that 'on average, we expect you to be working 6 to 7 hours a week on this course' (Nettle, et al., 2006, p10) and individual Jet students all appeared to have set this amount of time aside, but preferred to schedule it in very different ways.

An assumed advantage of asynchronous technology, independence of time, thus clashed with the demands of group work. The face-to-face course equivalent to DZX999 took place during a week's residential school, at which study had clear priority over other commitments and students took a break from work and family in order to study together. Online, they juggled a series of time constraints among which study could rarely take precedence. Their independence of time was therefore lost and replaced by a need to interweave their timetable with those of many others.

Arranging a work plan to take into account such disparate timetables was not an easy matter, but the information in the introductory emails produced by many students could have been employed as a useful resource. However, tutors did not encourage students to

prioritise or utilise this information, and there was no indication that students did so. This resulted in a number of problems: students wasted time trying to arrange to meet synchronously at times when others had already stated they were not free, they felt ignored or abandoned because they had no awareness of others' schedules, they did not make effective use of time when the majority of students were available, and they found it difficult to judge how hard other group members were working.

6.5 Lack of value accorded to social talk

The lack of value accorded to social talk in this setting was communicated to learners by staff in three main ways: the lack of concern to preserve such talk in an accessible form; the failure to extend or develop such talk, and tutors' moves to limit student contact other than through the medium of FirstClass.

In all three groups studied, some group members introduced themselves and provided background details about their situation. Interview data indicated that students from other groups also posted introductory messages. However, unless encouraged by tutors, these details tended to be expressed in only one or two sentences. The Sapphire group tutor, who was constrained by working without the support of another tutor, neither encouraged nor modelled the sharing of personal details, and most introductions in that group consisted of only one or two sentences.

When tutors did act as discourse guides, encouraging and modelling the use of introductions, they did not suggest that the details in them might prove useful in future, and should be marked for later retrieval. Because they were not prioritised, the messages were submerged beneath a flood of subsequent postings, their content forgotten. Nell, one of the students interviewed, commented that

> one of the things brought up towards the end of the project was our lack of personal details about each other which included not knowing each other's age and race.

> Although when we had been allocated to groups the tutor suggested we tell the group about ourselves, only brief information was given, mainly about occupation and locality.

Even when students supplied numerous facts about their situation, these were not employed to resource timetabling or discussion. In Jet group, tutors encouraged students to post detailed introductions, including descriptions of their work patterns. They acted as discourse guides, providing models of such introductions. However, their modelling suggested that they were not initiating social exchanges, because they made no subsequent move to extend this dialogue by responding to personal details revealed by students in their introductory messages. These early postings thus functioned as exercises to stimulate task-focused dialogue rather than as the start of a social dialogue. When interviewed, group members reported that 'when we were first put into groups we all did an intro mail' but these were 'never really mentioned afterwards'.

When students and tutors identified that ideas or details were significant to the group, they made efforts to preserve these in accessible form. FirstClass software allowed tutors to create archive folders in which postings and documents could be stored. Students on the course were not able to do this, but they had the option of asking tutors to do so. They could also save information within documents, or print it out for later reference. In the case of material clearly related to the course, students and tutors used all these methods to preserve contributions that they considered to be significant. However, there was no evidence in the conferences or the interviews that they worked to access or preserve either biographical information or details of individuals' work schedules.

Social dialogue within the conferences therefore remained both undeveloped and unpreserved. It was also limited, because students were discouraged from exchanging emails outside the FirstClass system. When interviewed, two of the students referred to this happening and it was also observed in the Pearl conference. Students in Pearl mentioned

that they had been exchanging information in emails, and their tutor posted: 'please make sure that you use the OU system and not private emails for postings about the course and project.' This appeared to be a reasonable request, given that tutors required access to the group's work in order to support and assess it. Students had limited time to work together, and needed to be discouraged from engaging in irrelevant or unproductive interaction.

However, discouraging email contact worked to limit a group's interactions to the public, archived arena. This contrasted with tutors' personal experiences of the advantages of communication outside the conferences, which they referred to in interviews. Tutor Joanna wrote that she 'felt more in touch with the other tutors this year, having met them. Emails can sometimes be terse, but if you've met the e-mailer, you can fill in the gaps.' Tutor Renée echoed these advantages of non-conference contact with fellows: 'It really helps me if I have met the partner – though this is rarely the case. Even chatting on the phone lends a bit of camaraderie'. Tutors were aware that informal contact through different media could supports online working relationships, but the assessment and timetabling demands of the course prompted them to limit students' access to such contact.

Exchange of social information was therefore limited in the project group conferences. However, Jet and Pearl groups did exchange such information in the first week the conferences were open, when the tutors posted detailed introductions, including information about what they had done in the past, what they intended to do in the future, and their current work patterns. Students responded by posting similar messages and, although in subsequent weeks these introductions were buried beneath a mound of other messages, they served to initiate extended dialogue and to establish some common ground shared by group members. Because the tutors in these groups acted as discourse guides who modelled the writing of introductory postings, there was some awareness of others' lives, and students did continue to report on significant changes to their schedule.

By contrast, the Sapphire group tutor's introduction was very short: 'Hello, I will be your tutor in this room and Val will support as necessary. Phil.' Evidence from Jet and Pearl groups indicates that it would have been usual at this point for the group's other tutor to post an introduction and thus stimulate discussion, but Philip's colleague never arrived in the group, leaving him to hold the fort alone. Although this was a problem for Philip as tutor, it provided a useful analytical contrast to the experience of Pearl and Jet groups, demonstrating the importance of this early exchange of social information. In Sapphire group it was a student, Ryan, who made the only detailed introduction (Figure 8).


From: Ryan pseudonym

Subject: Initial thoughts

To: DZX999 Sapphire

Date: Saturday 11 November, 2006 4:17 PM Message history

Amy/Tamara/Georgia/Teresa

I was just looking in our postings about project choice to see if anyone has had some preliminary ideas about the sort of thing they'd like to do. Amy and Tamara, , you mentioned memory with visual representation of an object compared to not which would certainly interest me as well. To be honest anything in this option area I find good. So perhaps if Georgia and Teresa are interested then we might develop something along those lines

My understanding is that we have to submit one joint project proposal by Thursday and that we should try and engage our tutors earlier in the week with a preliminary draft so that we know we're on the right lines (or not) particularly on the ethical piece. I will refresh myself on the DSE999 chapter (it's 5 years since I did DSE 212 but I've done all the 4 main Psych courses now so hoepfully can remember something about memory - as it were!) just to get up to speed. If you had any more specific thoughts on our project just post them up here.

Generally I'm able to access First Class most days and I'll let you know if that's not the case. It tends to be late evenings when I do the study due to work being fairly manic currently. I will be away from Dec 1 to 13th but will have First Class access for most of this time so with any luck won't pose too much of a problem.

Look forward to working with you all

Ryan

Reply Reply with quote Forward

Figure 8: Posting from the first week of Sapphire conference.

No one in Sapphire group responded to any of the personal details in this message, and the tutor gave no indication that social exchanges could be valuable to the group. The style of

Ryan's posting was at odds with the terse, work-focused messages posted by other group members. This conflict of styles continued throughout the conference; Ryan's postings were three times as long as those of other students in his group. He continued to include personal details about his work schedule and his research progress, while other group members continued to disregard this information.

Sapphire students did not follow Ryan's lead but, instead, took their tutor as a discourse guide and confined themselves to task-based discussion, as would be expected of work groups in a seminar room. There was no evidence that they attempted to bond their group through social discussion or personal observation. This lack of shared social information led to tension between students because they were unable to interpret the actions of other group members, could not judge the reliability of others or the effort put in by them, and could not produce a satisfactory work plan. Despite a lack of disputational dialogue within the conference, the resulting tensions conflicts ultimately led to the near collapse of the group, as the following section shows.

6.6 Tensions within Sapphire group

Ryan made it clear in his introductory posting (Figure 8, above) that he was going to be on a business trip for two weeks during the period the group would be carrying out research together. When he went on this trip, despite his temporary location abroad, he made use of the independence of place afforded by asynchronous technology, and continued to post messages in the conference. However, his openness about where he was, what he was doing and his research progress were not reciprocated. This may have been related to his style of communication – his postings may have been interpreted as arrogant or self-important rather than friendly and helpful. Even if this was the case, others in the group made no effort to share personal information that was relevant to work patterns and timetabling, or to engage with Ryan's contributions in these areas.

While Ryan was away, other group members made no reference to his business trip, displayed no awareness of it, and made no effort to help when he explained his difficulties in obtaining more than six research participants while away from home. The lack of response from students and tutor suggested that they did not accord importance to this type of information. Not only did his colleagues ignore cues for social banter relating to shopping and social life, but they also did not acknowledge his failure to find research participants – although this failure delayed the progress of their research.

Apart from Ryan, none of the Sapphire students let group members know of their plans or constraints, thus indicating that they considered the sharing of social information to be irrelevant to their work together. Each of them neglected to post messages in the conference for a week or more without advance explanation and these extended and unexpected absences caused significant problems on the six-week project. Amy did not post at all between 2 and 11 December, and it was only on her return that she explained, 'I've just finished moving house, so have been overloaded with packing, moving and then unpacking most of which I had to do myself!!!' Her unannounced absence highlighted how little social communication members of Sapphire engaged in, even when their individual circumstances had a direct impact on the group's ability to fulfil its work obligations. Tamara was absent for a fortnight before posting 'sorry for not responding so much, I've only been up to reading some message lately'. This apology and her comment four days later that 'C.F.S., Christmas and psych experiments don't mix very well' imply that she suffered from chronic fatigue syndrome but, if so, this was her only reference to it. This suggests that she either did not feel secure enough within the group to share details of her illness, or that she did not feel that personal information was relevant to the group, despite its impact on her contribution.

When interviewed several weeks after the close of the conference, tutor Philip attributed the group's failure to work together to Ryan.

> Sapphire group were very reluctant to debate, discuss or meet on-line. I believe this was because one individual was all over the world on business and just wanted to get things done without working at it or testing it and he annoyed the others.

The impression the tutor was left with is at odds with the conference data. Despite Ryan's business commitments, conference postings showed him working extremely hard whenever possible. On 14 November, for example, he posted four times, starting at 09.23 and continuing until 01.57 the following morning. At lunchtime that day, in the middle of a long posting, he explained to his fellow students: 'I've just managed to flip through your two documents over lunch and looks good. I will elaborate late tonight when my crazy work schedule (woken up by a client at 0600 who forgot time difference!) subsides.' It is possible that his writing style angered or alienated other group members, but there is no evidence of this, or of other group members making attempts to work or communicate in other ways. The conference data thus suggest that his tutor gained an enduring impression of him as a disruptive influence solely because he was alone in sharing social information and because he signalled his timing difficulties in advance, thus drawing attention to his enforced absence. Others went missing for longer with less explanation, but their silence benefited them because it was less noticeable than Ryan's apology. These long, unexplained absences by group members limited their ability to collaborate effectively.

As they were working on a quantitative project, students could not carry out their analysis until they had everyone's data, but much of this arrived late, after unexplained delays. By the final week of the conference, when the group was supposed to be collaborating on a presentation, most students were not engaged, leaving everything to Teresa, who commented that she felt her work was pointless. On the day of the deadline, she posted:

> Just wanted to know what others are going to contribute and what you reckon to the abstract I wrote, I am still waiting on feedback and your ideas and input too. We really need a bit more before this is sent to Briggs otherwise what is the point of this presentation.

Her posting was followed by one from the group tutor, encouraging others to contribute, but the only response Teresa received before submitting the work was an unhelpful comment from Tamara 'seems fine, with in time constraints as [the tutor] said, hope everyone approves. I don't think I will be able to log on anymore today, so thank you for doing this.' The presentation was submitted without revision or critique, the production of one individual rather than a collaborative endeavour.

6.7 Supporting collaborative learning

In order to collaborate effectively, groups need to construct and maintain a shared conception of their task. This involves establishing a shared discourse, mutually acceptable communication patterns and a degree of common knowledge. The example of Sapphire group shows that as learners work to establish common ground, they are hampered if they treat social and personal details as irrelevant to their work and therefore do not respond to, preserve or even offer such information.

In a face-to-face classroom social talk would usually be discouraged – but personal and social exchanges would take place in breaks and both before and after class. In an asynchronous conference, personal and social details are only likely to be exchanged in the work environment. Moving to a separate online environment to talk and socialise is time consuming, and not necessarily the attractive and pleasurable activity that a break-time stroll to a café would be in a face-to-face environment. If the exchange of social information is ignored or not valued, group members are able to avoid social exchanges without difficulty but encounter problems when they try to gauge the expectations, reliability and availability of their colleagues.

Even when social exchange is limited, groups of learners are still able to establish a shared vocabulary, mutually acceptable communication patterns and a degree of common knowledge. They do this using techniques identified by Lapadat (2007) and discussed in

Section 2.15, including greetings, humour, social remarks and personal anecdotes. Other methods they use include references to shared cultural experience, cohesive ties, building social understanding, establishing adjacency between postings and presenting their input from a group perspective.

6.7.1 Shared cultural experience

Learners make anaphoric references to past experience, employing familiar terms and genres. Both students and tutors in Jet, Pearl and Sapphire mobilised accounts of themselves, their knowledge of western culture and, more specifically, their experience of the study of psychology at the Open University in order to identify common ground. They quickly built on these elements, creating vocabulary and common knowledge that were specific to their group. They made use of cohesive ties between their postings to create a shared perception of the past and shared expectations of the future.

The project groups were made up of students and tutors who initially knew little about each other's academic experience or social setting, but who were aware that other group members could be based anywhere in the world. There was therefore very little reference, particularly in the early days of the group conference, to shared cultural experience. Participants did have shared experience of the Open University and of the opening weeks of the course, and this enabled them to utilise a common vocabulary that made confident use of Open University terminology and of course-specific vocabulary. In tutor Joanna's first posting to Jet group she could therefore write, 'Zoë or I will be popping into the conference about once a day over the next week. If you need to ask us a question – mark it "To Tutor" in the subject line – as I'm sure there'll be loads of red flags.' Not only was she confident that the students would understand what the terms 'conference' and 'subject line' referred to in FirstClass, she also assumed that they would understand 'tutors' to be an

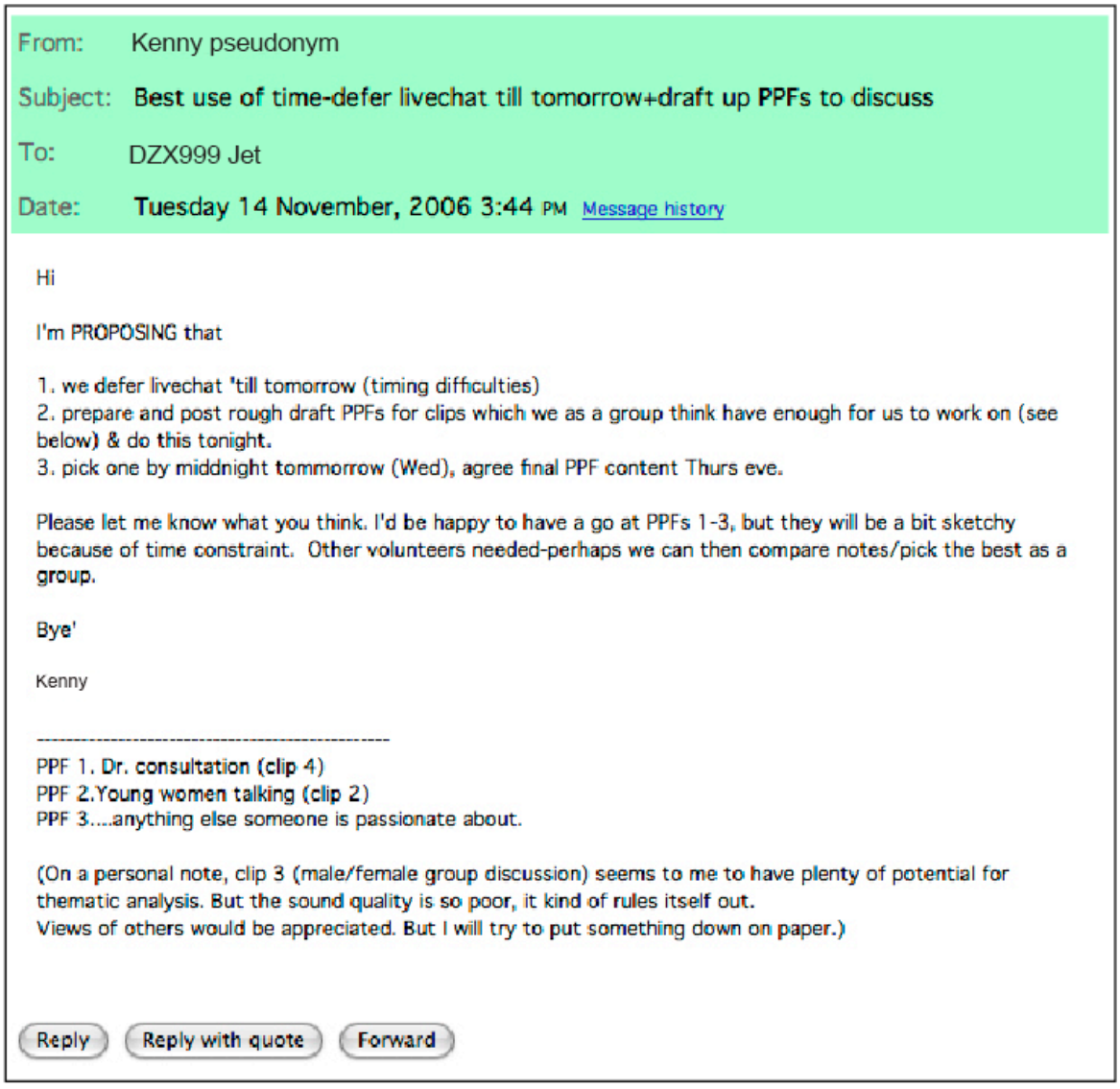
alternate term for the associate lecturers working on the course, and that they would already be aware that ‘red flags’ were indicators of unread conference messages.

6.7.2 Cohesive ties

As Chapter 5 showed, group members made use of cohesive ties to link their dialogue coherently and thus attain assessed outcomes. They also employed these ties to accomplish the group building necessary to support this knowledge building. Figure 9 shows a posting written by a student early in the first week of the Jet group conference. At the time it was written, Jet group members had little experience of working together and one group member had yet to participate. Section 5.3 showed how the posting’s author, Kenny, used vocabulary, names, pronouns and cataphoric links to build understanding related to the development of a research proposal. At the same time, he used them to establish how those with access to the conference would be working together as a group. For example, as described in Section 5.3, he treated the members Jet as a group by presuming a degree of shared knowledge. Kenny’s posting contrasts with the one from Sapphire group shown in Figure 10 (below). This posting was also written during the first week of group work but it made use of fewer textual devices to link individuals and establish the group.

In his posting (Figure 9, below) Kenny made extensive use of cataphoric links to stress group action and group identity. His pronouns and synonyms were inclusive: ‘we’, ‘us’ and ‘we as a group’ replaced the formal group title generated by the FirstClass software. All three groups experimented with names, trying out titles on the lines of Jets, Sapphire Group, Team Pearl and other names involving more elaborate word play. Renée, one of the tutors interviewed, connected the use of such titles with successful group formation. When asked to identify a successful set of students, and what made them successful, she wrote about the ‘Oranges’ from a previous presentation of the course:

They really seemed to form a group identity – making jokes about the group name etc. I think they called themselves the Jaffa cakes, or something like that and put in a Jaffa cake logo on some of their emails.


From: Kenny pseudonym

Subject: **Best use of time-defer livechat till tomorrow+draft up PPFs to discuss**

To: DZX999 Jet

Date: **Tuesday 14 November, 2006 3:44** PM Message history

Hi

I'm PROPOSING that

1. we defer livechat 'till tomorrow (timing difficulties)
2. prepare and post rough draft PPFs for clips which we as a group think have enough for us to work on (see below) & do this tonight.
3. pick one by middnight tommorrow (Wed), agree final PPF content Thurs eve.

Please let me know what you think. I'd be happy to have a go at PPFs 1-3, but they will be a bit sketchy because of time constraint. Other volunteers needed-perhaps we can then compare notes/pick the best as a group.

Bye'

Kenny

PPF 1. Dr. consultation (clip 4)
PPF 2.Young women talking (clip 2)
PPF 3....anything else someone is passionate about.

(On a personal note, clip 3 (male/female group discussion) seems to me to have plenty of potential for thematic analysis. But the sound quality is so poor, it kind of rules itself out.
Views of others would be appreciated. But I will try to put something down on paper.)

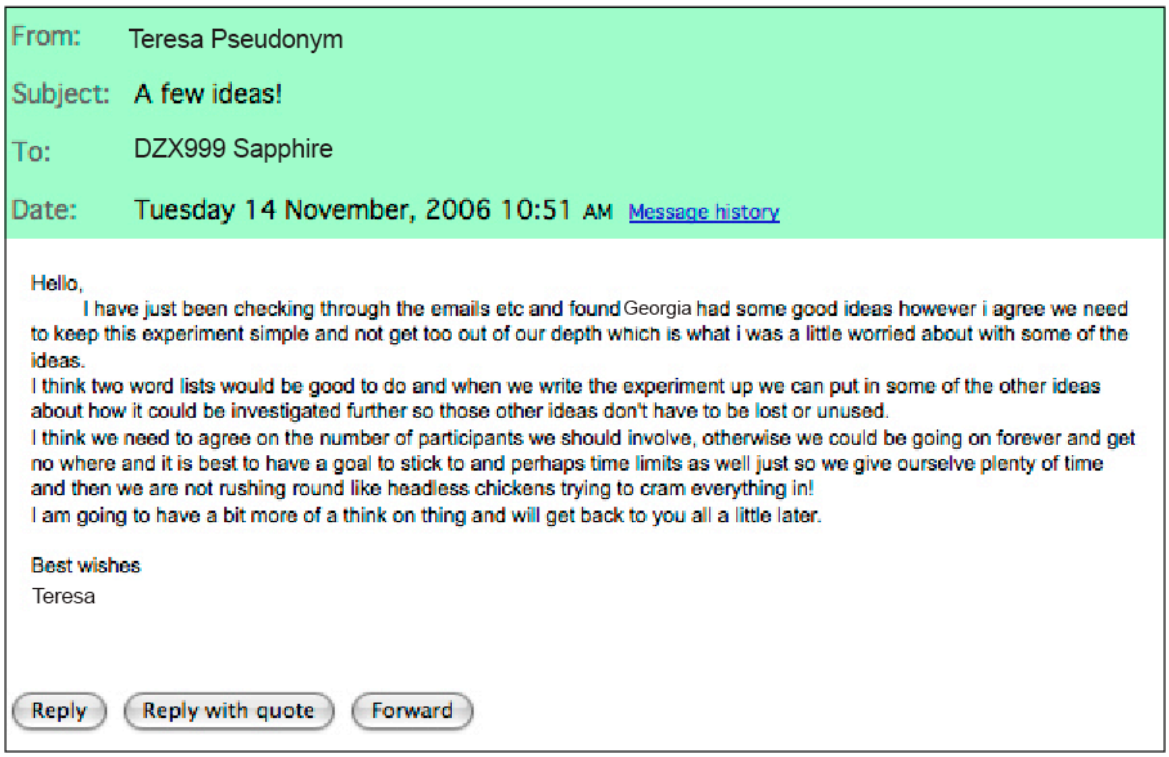
Reply | Reply with quote | Forward

Figure 9: Posting from the first week of Jet group conference.

6.7.3 Building social understanding

This use of plural pronouns in Kenny's posting was supplemented by a series of links to expected future postings, stressing that the students would be making decisions as a group: choosing a video clip to study, comparing notes and picking the best project proposal form. His posting was full of proposals for future action, and these repeatedly stressed that the seven students in the group would be pooling opinions and coming to group decisions.

By contrast, Figure 10 shows a posting from the first week of the Sapphire conference. Their tutor described this group as one of the most difficult he had ever had to manage. He wrote that they 'were very reluctant to debate, discuss or meet on-line' and that they produced 'all types of excuses' for not getting on with their work: 'such as migraines, car crashes, Xmas parties, Kids shows at school, hangovers, dying relatives & they really had to be pushed to get the bare minimum of work.' Teresa, the student who ended up meting the group's presentation deadline, also reported problems, 'I was quite annoyed when the excuses came in as we were meant to be working together as a team and I felt very much alone with only my tutor available for support.'


From: Teresa Pseudonym
Subject: A few ideas!
To: DZX999 Sapphire
Date: Tuesday 14 November, 2006 10:51 AM Message history

Hello,
I have just been checking through the emails etc and found Georgia had some good ideas however i agree we need to keep this experiment simple and not get too out of our depth which is what i was a little worried about with some of the ideas.
I think two word lists would be good to do and when we write the experiment up we can put in some of the other ideas about how it could be investigated further so those other ideas don't have to be lost or unused.
I think we need to agree on the number of participants we should involve, otherwise we could be going on forever and get no where and it is best to have a goal to stick to and perhaps time limits as well just so we give ourselve plenty of time and then we are not rushing round like headless chickens trying to cram everything in!
I am going to have a bit more of a think on thing and will get back to you all a little later.

Best wishes
Teresa

Reply | Reply with quote | Forward

Figure 10: Posting from the first week of Sapphire group conference.

The postings in Figure 9 and Figure 10 are comparable in that both were written on the same day, early in the collaborative process, when the groups were struggling to devise their project proposal in order to meet a deadline later in the week. The authors of both used textual devices to position themselves within a group. They achieved this by making extensive use of the first person plural, repeatedly using the word 'we'. In addition, both

commented on previous postings by other group members, both made reference to tasks that the group would carry out together and both referred to future group decisions.

However, Teresa's posting showed that Sapphire group members were not making use of some of the tools for building social understanding that were employed by Kenny and other members of Jet group. She made little reference to shared knowledge or to shared experience. She also made no use of course-specific vocabulary, and failed to pick up on the distinction between conference postings and emails. Like all other members of the Sapphire group, she did not change her font settings from the default; neither did she distinguish her postings from those of others by marking them with an icon, as members of other groups did. Sapphire group's tutor did not model the use of these affordances of the medium, and the group as a whole developed little shared knowledge of many of the features of FirstClass that support coherent, comprehensible dialogue. They made almost no use of font, point size or colour to distinguish between individuals' postings.

6.7.4 Establishing adjacency between postings

Sapphire group members also made limited use of techniques for linking their postings to form coherent dialogue. FirstClass messages can be linked in threaded sequences and these threads can be extended over many postings, as was the case with the Jet thread discussed in Chapter 5. During Sapphire's first week together as a group, they managed to create only one thread that was more than a two-part initiation and response. Group members repeatedly used question-and-answer pairs to create adjacency. This limited the discussion to exchanges between pairs of individuals, rather than linking individuals by building group dialogue. In the first four days of Sapphire conference, half the postings were targeted at a named individual. This focus on question-and-answer adjacency pairs was clearly modelled by the tutor, 66% of whose postings in this period were addressed to individuals. The use of these pairs to establish adjacency and cohesion meant that

exchanges were unlikely to build into group discussions, and that individuals were limited in their ability to function as a group.

6.7.5 Presenting input from a group perspective

Another difference between Teresa's message in Figure 10 and Kenny's in Figure 9 lay in her use of the first person singular. All four of Teresa's paragraphs began with the word 'I' and, overall, she used the word eight times, in comparison to Kenny's three uses. Teresa used 'I' to refer to her individual opinions, thoughts, actions and plans: 'I think', 'I am going' and 'I was a little worried'. She thus distinguished herself from her project group, classifying them as 'you all'. By contrast, Kenny's use of the first person singular positioned him as a member of the group. He was more tentative, he proposed to act as a group member, his input was conditional on the group's approval, and he expected comments and reactions: 'I'm proposing', 'I'd be happy' and 'I'll try'. In addition, he shifted away from the nominative case – from 'I' to 'me' – suggesting that he was considering his contributions from the standpoint of the group.

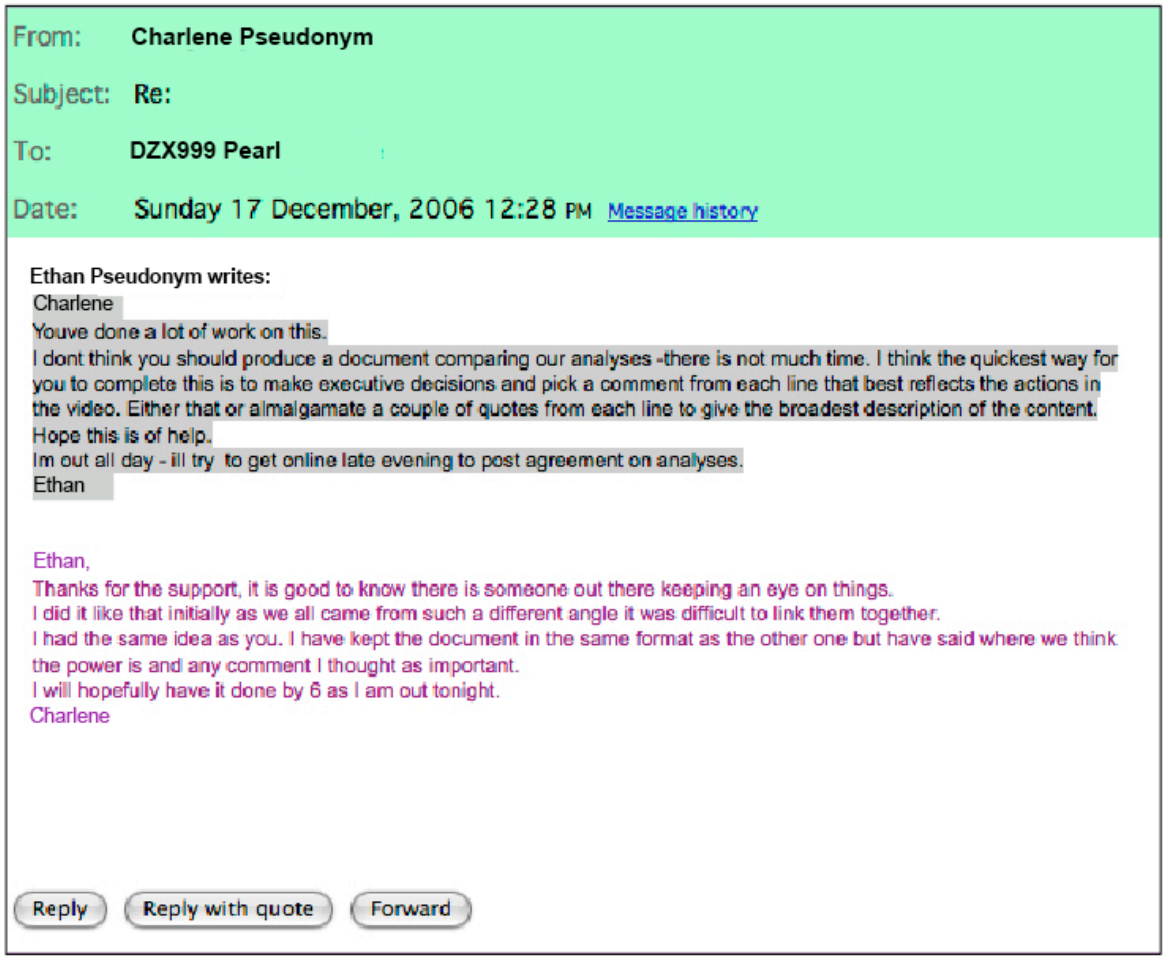
Together, the two postings employed several discursive devices to construct social understandings within the groups. Use of collective names for the group and of the first-person plural, references to shared knowledge and shared vocabulary, cataphoric links to expected future actions and discussion and anaphoric links to past discussion and action were all important, as were an expressed interest in the opinions and input of other group members, the use of threading to establish adjacency within group dialogue and an expressed courtesy and respect towards other members of the group. However, although all of these tools were used by Kenny, and by other members of Jet group, only some of them were used within Sapphire group. These social understandings allowed individual learners to work effectively together as a group in Jet. Students in Teresa's group, Sapphire, found

this much more difficult, as shown above, and Teresa and her tutor both referred in interviews to individuals' failure to work together as a group.

6.8 Avoiding unproductive interaction

With varying degrees of success, learners were seen to use cohesive ties to bind themselves together as a group over time, building on past experience and proposing joint future actions. As group members they also needed to deal with areas of tension. They did this either by concealing these areas or by negotiating around them through the use of a variety of discursive devices. When this was not possible, they marked their disagreement by withdrawal and silence, and it was this absence of dialogue, rather than the presence of disputational dialogue, that marked unproductive interaction within the groups.

Important areas of tension identified in interviews were issues of group decision-making and the uses of silence, both of which were related to temporal issues including work patterns and timetabling. Figure 11 (below) shows a posting from Pearl conference, written at a time when these concerns could be expected to be at their height, a few days before the group's assessment deadline for producing an agreed analysis of their data. Charlene, the posting author, was negotiating a particularly tricky issue: she was collating the analysis of the other group members. This collation can be considered to have been a delicate object, because it was difficult to discuss without conveying something unintended or untoward. The potential for the development of disputational dialogue and unproductive interaction was very high. In her posting, Charlene employed various discursive devices to soften what was expressed and to avoid dispute. She was not alone in employing these devices; in this posting she worked closely with fellow student Ethan to avoid group conflict.


From: Charlene Pseudonym

Subject: Re:

To: DZX999 Pearl

Date: Sunday 17 December, 2006 12:28 PM Message history

Ethan Pseudonym writes:

Charlene
Youve done a lot of work on this.
I dont think you should produce a document comparing our analyses -there is not much time. I think the quickest way for you to complete this is to make executive decisions and pick a comment from each line that best reflects the actions in the video. Either that or almalgamate a couple of quotes from each line to give the broadest description of the content.
Hope this is of help.
Im out all day - ill try to get online late evening to post agreement on analyses.
Ethan

Ethan,
Thanks for the support, it is good to know there is someone out there keeping an eye on things.
I did it like that initially as we all came from such a different angle it was difficult to link them together.
I had the same idea as you. I have kept the document in the same format as the other one but have said where we think the power is and any comment I thought as important.
I will hopefully have it done by 6 as I am out tonight.
Charlene

Reply | Reply with quote | Forward

Figure 11: Posting from the final week of Pearl group conference.

By choosing to 'Reply with quote' to the previous posting, Charlene ensured that Ethan's posting appeared in its entirety at the start of hers. By placing her message within a thread in this manner, she clearly located it within the ongoing dialogue of the group. She also drew attention to the instructions Ethan had given to her: produce a document and make executive decisions. Ethan's contribution helped her to share responsibility for her actions; the combination of their postings demonstrated that she was working as a group member, rather than as an individual. She was also able to stress her unanimity with Ethan by saying 'I had the same idea as you'. She thus employed Ethan's input in a variety of ways to transfer responsibility for the consolidated analysis from her to the group.

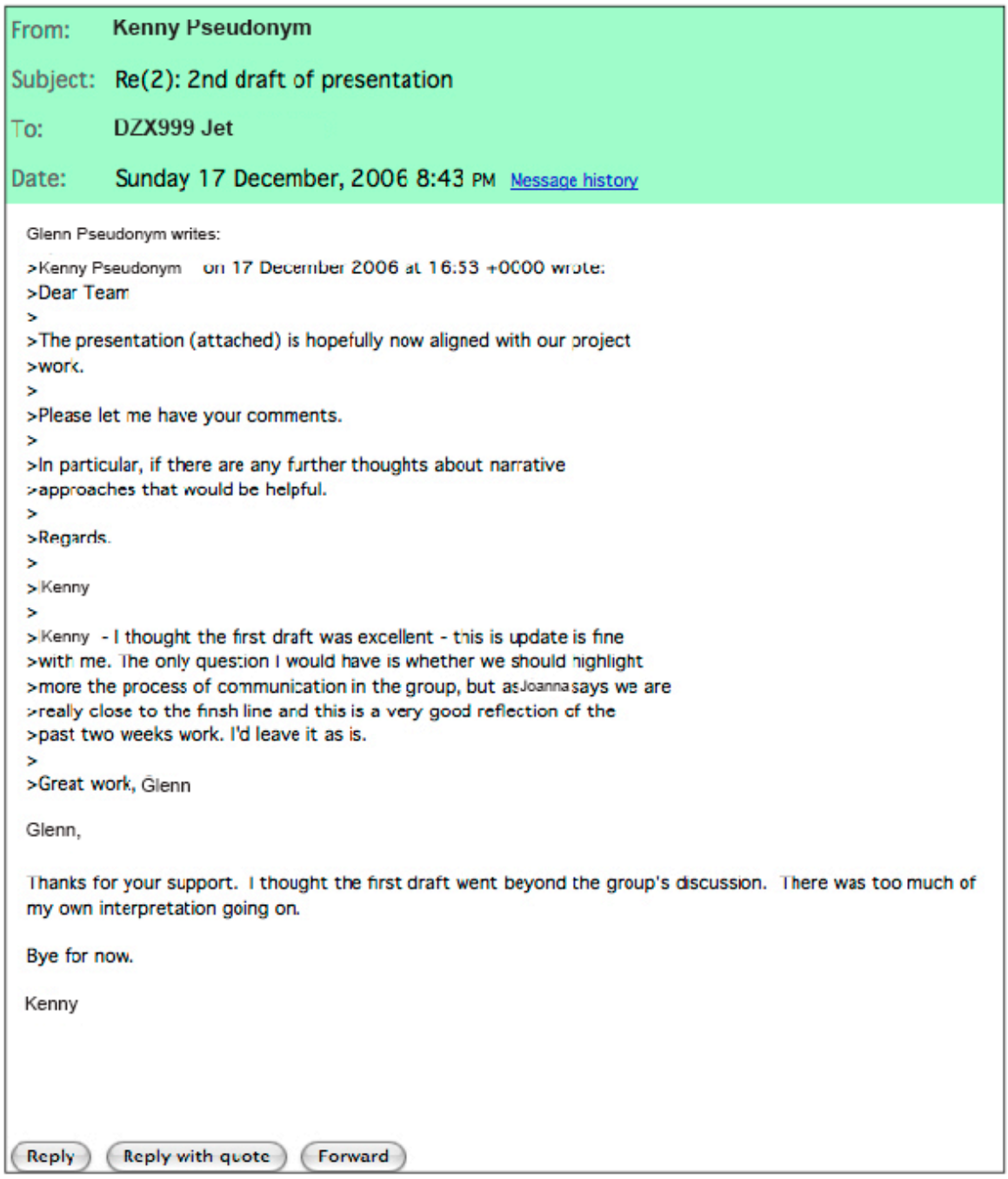


Figure 12: Posting from the final week of Jet group conference.

Although the students did not have access to the conferences of other groups, the techniques employed by Jet group to avoid disputational talk were very similar to those used by Pearl group. The Jet posting in Figure 12 was created on the same day as the Pearl posting in Figure 11. Like Pearl, Jet group was faced with difficult decisions in the face of an imminent assessment deadline. Author Kenny ensured that Glenn's posting appeared in its entirety at the start of his, by choosing to 'Reply with quote' to the previous posting. In

doing so, he mirrored Glenn's action, thus locating his input firmly within the ongoing dialogue of the group. He also drew attention to the instruction Glenn had given him: 'keep it as it is'. Glenn thus helped him to share responsibility for his actions, and Glenn's posting was backed up by reference to tutor Joanna. Just as in Pearl, the author used another student's input in a variety of ways to transfer responsibility for the consolidated analysis from the individual to the group.

The tone of the dialogue in both groups was polite and complimentary. Glenn began his message with a positive reference to Kenny's excellent work; Kenny began his message with a positive reference to the support provided by Glenn. As in Jet, the dialogue suggested that the students were thinking about each other's feelings. As in Pearl group, the form of the two postings indicated the unanimity of these two students. Kenny's posting mirrored Glenn's: both quoted another posting at the start of their message, both started and signed off with a name, began with a compliment and included a three-sentence paragraph followed by a short sign-off line.

Members of Jet and Pearl thus used the same discursive devices to deal with subjects that were difficult to discuss and to avoid conflict: they situated their input firmly within the ongoing group dialogue, they stressed unanimity with other group members, they transferred responsibility to the group and they complimented, mirrored and empathised with other group members. This combination of techniques helped them to avoid disputational dialogue and any overt signs of conflict. By contrast, members of Sapphire group utilised only some of these techniques, and the group came far closer to conflict.

Figure 13 (below) shows Sapphire group using fewer techniques to avoid conflict than either of the other groups. This posting was written the day after those in Figures 11 and 12, so there was considerable underlying tension because the group was not well prepared to meet the impending assessment deadline. By making a reference to the PowerPoint

presentation posted by Tamara earlier, author Georgia suggested a link between her posting and the preceding dialogue. The link did not include direct quotation and was therefore not as strongly made as the links in the other group. The link weakened as the posting progresses because Georgia went on to express uncertainty about what needed to be done, about what Amy had done, and about what Ryan was intending to do. If Amy or Ryan had concerns about their input being unappreciated or ignored, this posting would have been likely to reinforce these rather than to alleviate them.

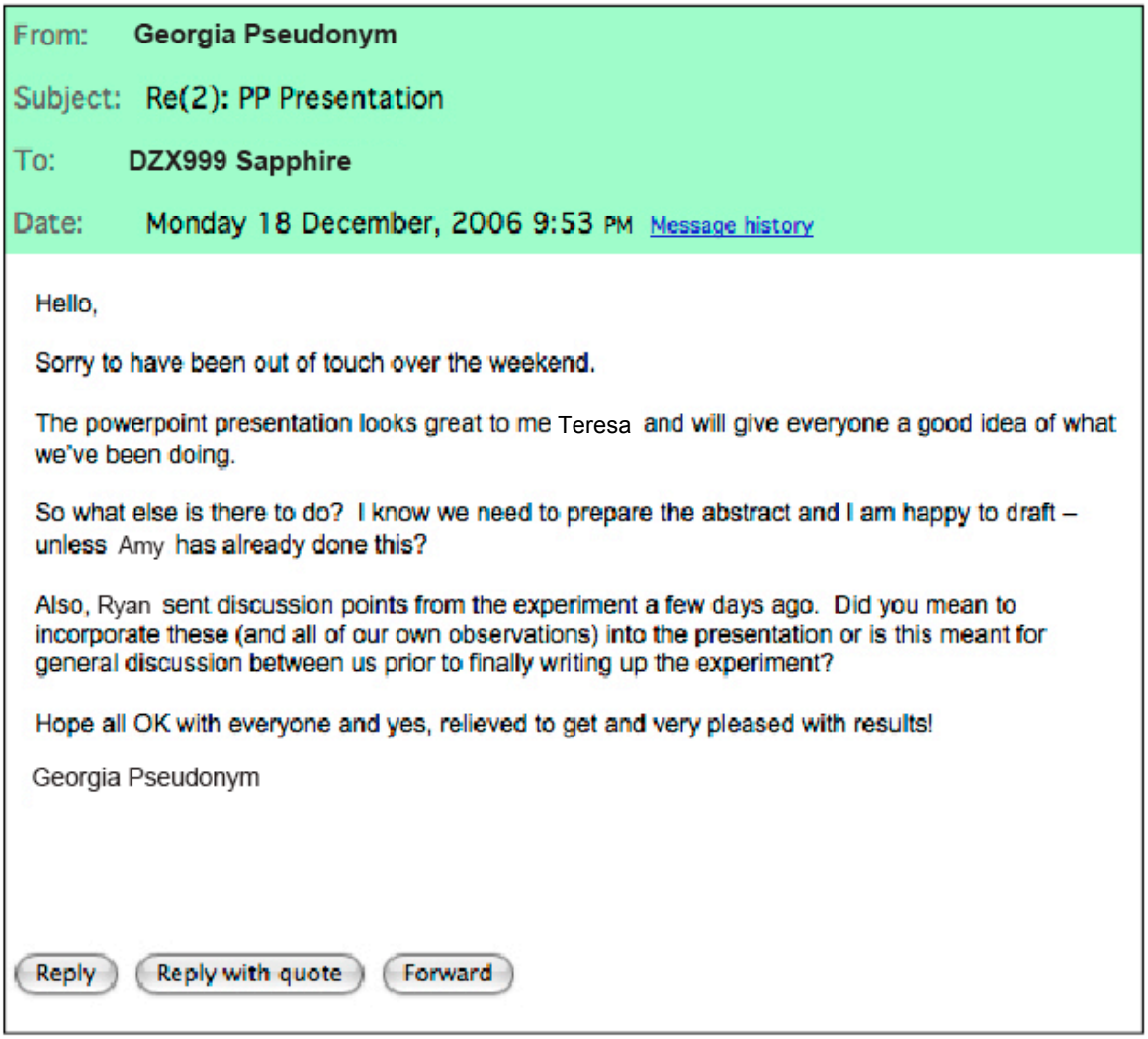


Figure 13: Posting from the last week of Sapphire group conference.

As in the other groups' postings, the dialogue in Georgia's posting was both polite and complimentary. Georgia apologised for her earlier absence and commented positively on work done by Tamara. She also included some limited empathetic input – the students had

just received exam results and she referred to this, although without showing any interest in the results obtained by others or any desire to extend social dialogue. However, she did not use other techniques employed by members of Jet and Pearl to negotiate delicate objects. There is no evidence of mirroring; this posting did not resemble previous postings in style or layout. Neither was there any transfer of responsibility from the individual to the group. Instead, the posting suggested that all group members were working as individuals and that they were failing to collaborate effectively.

The style of Georgia's posting was typical of others in Sapphire; the group used fewer techniques to avoid conflict than the other groups. Their omission of the techniques of transfer of responsibility from individual to group and of mirroring suggests that individuals were not working together effectively as a group, that they were not clear how to proceed, that they had limited awareness of what other group members were doing and thus limited ability to construct knowledge together. Sapphire student Teresa later commented on her experience at this point in the course:

> I was up till way past midnight trying to scrape a presentation together. I thought one of them could at least have had the decency to let me know a bit more in advance if they thought there might be a problem rather than after the deadline when it is too late.

Her comments within the conference showed the same frustrations: 'Can I have some response and support please!' and 'We really need a bit more before this is [submitted,] otherwise what is the point of this presentation.' This was not disputational dialogue, but it came very close to it in tone. Problems within the group were therefore signalled by the absence of specific discursive techniques. However, when tensions and problems became apparent, group members did not respond with the use of disputational forms of communication such as assertion and counter assertion. Instead, they utilised withdrawal and silence to mark their lack of shared understanding and agreed context.

6.9 Silences in asynchronous dialogue

In interviews, students repeatedly referred to the uses of silence either to indicate or to respond to areas of tension. Silence was a problem when group members withdrew from synchronous or asynchronous discussion, it was also interpreted as a signal that individuals had been excluded or ignored and it was employed as a strategy by individuals either to mask themselves and their feelings, or to deal with tensions within the group.

The silence of non-participation or of limited participation is difficult to interpret in a group that meets face to face, but it is even more ambiguous in online groups without access to visual backchannels. It is rarely clear whether those who are silent are lurkers, involved but not participating; free riders relying on the work of others; or social loafers who are not motivated to participate when others do not do so. Hard-working students may be temporarily silent because of illness, because they are having technical problems with their Internet connection or because they work on their studies in concentrated bursts, rather than studying for a short period each day. Social and personal details therefore help students and tutors to assess the participation levels of others at any point, to judge whether colleagues can be relied upon to complete work on time and to build working relationships.

Individual group members may adopt characteristics of lurkers, social loafers and free riders or others may mistakenly ascribe these roles to them. One student in Pearl group had a role that has not previously been identified in the literature – she was a ‘phantom’. Phantoms are individuals who, although listed as group members, fail to materialise. Not only do they not contribute, they do not log on in the first place. Staff on DZX999 reported that such phantoms are common on large online courses, as students register and then drop out for various reasons, without informing members of the course team. Like Pearl, groups with a phantom member may then waste time and energy both suggesting explanations for the silence of that group member and taking their presumed needs, interests and

experiences into account. In the face of no input and no response, learners find it difficult to make decisions and plan work together. In Jet, Pearl and Sapphire, any unexpected and unexplained silence on the part of a group member was dealt with tentatively by others and was treated as a delicate object when it was addressed at all.

The most common response to silence was more silence. Even when group members fell silent for a week or more, as happened several times in Sapphire, this rarely provoked comment in the conferences, whether from tutors or from students, although interviews with tutors demonstrated that they worked hard outside the conferences to locate and engage absent students. When a silence became disruptive to other members, they referred to it politely, positively or with humour.

In the case of Pearl's phantom member, a fellow student commented positively, 'I spoke to [a family member also on the course] and he mentioned that one of his team mates hadn't been able to get into FirstClass this week. What if Nicole has had the same problems?' Different approaches were employed in other groups: In Jet, when Kenny committed himself to posting a document early the next day and then fell silent, Eileen responded with humour and sympathy: 'Blimey that was 5 days ago. No pressure, Kenny. I just want to say we've missed you!' Even in the case of Sapphire group, when four students fell silent in the face of an assessment deadline, Teresa's response had polite elements, 'Can I have some response and support please!'

Students were clearly unwilling to make explicit judgements about silences in the group, although they were more forthcoming in interviews. Within the conferences, their unexpressed interpretations of these silences were as unproductive as disputational dialogue would have been. Silence can be an element of productive interaction, an element that implies individuals are getting on with allotted tasks, or pausing for thought. None of the students interviewed referred to the silences of others in a positive way. Individuals

either considered silence to reflect badly on them or on others in the group. They described some of their fellows in terms that suggested they were free loaders or social loafers. Ilana, for example, was 'extremely frustrated that a couple of members of the group hardly participated at all with ideas or completing their task for the group yet benefit from the others' input.' This experience of unproductive interaction had implications for her ongoing learning because she added, 'I think if I did group work again I would sit back and let everyone else do the work.'

Equally unproductive was students' interpretation of silence as an indication that their work had not been valued, or that they were being ignored. Two of the students interviewed limited their contribution to the group in the face of silence. Vernon described his development of a list of neutral words for his group's research. He began to withdraw from the group because

> these were not used, and I don't think I got a reason back for this […] the rejection of my ideas was a little disheartening so I probably didn't contribute as much to the second half of the discussion, other than giving results as instructed.

Conference data suggested that members of Jet group were active and engaged. However, interview data showed that Olivia felt ignored and disregarded, as Vernon did in his group. For Olivia, this produced a situation in which

> The three main guys tended to converse with themselves and the rest of us tried to contribute when we logged on, but I did feel on the outside of it sometimes. A couple of us felt lost and overwhelmed with the workload, and it didn't help being in a group with very intelligent people who know they are…

These uses and interpretations of silence were personal and hidden from view. There was no indication within the conference data that Olivia felt lost, ignored, overwhelmed and disregarded, or that she subsequently disengaged. A word count on conference postings ranked her in the middle of Jet group and substantially ahead of all the students in Sapphire and Pearl. It is therefore unlikely that any of her fellow students would have noticed or

responded to her dissatisfaction and subsequent withdrawal, and there was no evidence that they do so. Her tacit protest went unnoticed.

The difficulty with interpretation was partly because, as described earlier, students rarely shared, and did not seek to preserve, social information. They were therefore limited in their understanding of others' characteristic ways of working. As discussed in Section 6.2, interviews suggested that they were also limited by another use of silence, a conscious and strategic concealment of identity and of feelings related to other group members or to the work of the group.

This strategic use of silence can be linked to the social and affective factors that may provoke disputational dialogue in a face-to-face setting. Disputational dialogue arises when learners are more concerned with protecting their own interests than with collaboration. It is when students perceive other group members as threatening rather than supportive, when their relationship is competitive rather than collaborative, and when challenges are interpreted as attacks rather than exploration, that learners employ disputational dialogue. In the asynchronous groups studied here, when these social and affective factors were influential, dialogue did not become disputational. Instead it was replaced by unproductive withdrawal and silence.

However, these strategies are difficult to identify and interpret. Periods of active and enthusiastic engagement may be separated by periods of silence and withdrawal that mark uncertainty and dissatisfaction but, without the help of social dialogue, group members cannot distinguish breaks for these reasons from breaks due to laziness, apparent breaks due to hard work offline or breaks due to other pressing concerns. Apart from persistent absence, it is difficult to identify silences within a conference due to students' differing work patterns. Unlike disputational dialogue, which is immediately apparent and likely to provoke a fast response from alert tutors, it was only when a deadline was approaching and

expected input was not supplied that group members sought to end silences. In doing this, there was no evidence that they sought to deal with the cause of the silence – their only strategies were to comment on it, joke about it, seek to end it or, rarely, complain about it.

Both tutors and students appeared to have few strategies for identifying, interpreting and responding to silences within a group. When a student's non-participation was persistent, tutors were likely to contact them individually by email, or to pass the problem to other staff on the course team so that it could be dealt with by letter or by phone. These one-to-one approaches were outlined in interviews, but were hidden from students within the conferences, who were therefore not aware of the amount of energy devoted by staff to the pursuit of non-participants and phantom students.

As the literature shows, silence within dialogue is not necessarily unproductive (Alvarez & del Rio, 2002). It may support dialogue by providing opportunities for listening, for synthesis or for thinking. It can also indicate that group relationships are strong enough to support companionable silences or extended non-verbal interaction. However, the silence used by students as an alternative to disputational dialogue is unproductive because it is linked to withdrawal, to the taking on of unproductive roles such as free rider and social loafer and to a failure to share relevant social and personal details. When students use it as a response to perceived problems, rather than dealing with those problems openly, it can lead to group fragmentation. As tutor Joanna noted: 'the less you do, the less you buy into a project; so it becomes a vicious downward spiral.'

6.10 Negotiation and avoidance of unproductive interaction

This chapter has addressed the question 'How do groups of learners working together in asynchronous environments negotiate and attempt to avoid unproductive interaction?' It has shown that they avoid the use of disputational dialogue and instead negotiate and

attempt to avoid unproductive interaction in three ways: by the exchange of social information, by the use of discursive devices, and by the use of withdrawal and silence.

Exchange of social information was limited in all the groups studied and there was little evidence that students or tutors regarded such information as valuable to the group. Although some tutors appeared to initiate the exchange of social information by posting introductory messages, including personal details, they made no subsequent move to extend this dialogue by responding to personal details revealed by students in their introductory messages. These early postings were treated as exercises to stimulate task-focused dialogue rather than as the start of a social dialogue. Nevertheless, they played a valuable role in establishing groups and enabling learners to achieve their learning outcome of working with others to carry out the stages of drafting research proposals, data collection, analysis and interpretation.

Although tutors made no overt move to limit social discussion, when group members offered information about their lives or about their work schedules, tutors did not move to preserve this information in a readily accessible form as they did with key task-based postings. Neither did they act as discourse guides and model the development or extension of social dialogue (Littleton & Whitelock, 2004). Constraints of timetabling and assessment led them to limit opportunities for private, un-archived conversations by encouraging students to carry out all their discussion within FirstClass.

Instead of groups being integrated within the day-to-day lives of their members, they were thus confined to First Class, where they were developed textually and divorced from contextual information that could help learners to understand the behaviour and work patterns of their colleagues. Asynchronous dialogue was used to build links between group members based on their experience of the university, of the course and, more specifically, of the task in which they were engaged. It was used much more rarely to build links based

on wider experience. A sense of unity was created by anaphoric links to earlier events experienced by the group, and by cataphoric links to future group decisions and actions. This sense of unity was enhanced by reference to the group as a unit, by the use of nicknames for the group and by the use of the first-person plural to refer to group actions. However, the groups did not work to enhance their shared understanding by situating it more firmly within the lives of individuals.

This led to tensions within groups, because neither learners nor tutors had sufficient information to interpret the actions of other group members. Working as a collaborative group requires individuals to make judgements about the reliability of others within the group and their suitability to carry out tasks, but without the exchange of social and personal details these groups had no shared understanding of each other on which to base these judgements. They also lacked a shared context, because group members had very little information about the circumstances and constraints under which other group members were working. They therefore found it difficult to interpret how hard their colleagues were working, or to judge their availability at different stages of the project.

Although group members were limited in their ability to build social understanding together, the constraints of an asynchronous environment made it important for them to avoid personal conflict. Arguments and disputes were potentially protracted and time-consuming, due to the staccato nature of asynchronous exchanges. In order to meet deadlines and assessment targets, students had to ensure that online dialogue proceeded smoothly and steadily. They used a variety of textual devices to achieve this. Not only were they unfailingly courteous to each other, on the two occasions when the groups were under deadline pressure, members of both Jet and Pearl worked to link their contributions firmly to those of the group, and they stressed their links with the group by mirroring the contributions of others.

As a result, there was little use of disputational dialogue, despite the tensions related to work schedules, timetabling and decision-making. Although learners used the discursive devices described above to deal with these areas of tension, individuals struggled to work as members of the group when they perceived that they were working harder than other group members, or when they perceived that they were being ignored or disregarded by others. In these cases, they did not use disputational dialogue but, instead, employed silence and withdrew from the group to some extent. Unproductive interaction was not apparent because it was the silences, rather than the postings, that expressed tension, disagreement and moves to work as an individual rather than as a group member.

Despite the obstacles to the development of social understanding in asynchronous group settings, group members continually used discursive devices and silence to negotiate away from dispute. Groups were therefore able to work together peaceably, with individual concerns well concealed. However, such a restrained atmosphere is not necessarily adequate to support the collaborative construction of knowledge. Learners need to connect and build upon the ideas and experiences of individuals and this is not possible if they are concentrating on withholding their opinions in order to avoid conflict. In the short term, as Chapter 5 showed, cumulative dialogue serves them well, but little or no use of exploratory dialogue was observed in the short term.

If asynchronous groups are so concerned to avoid the unproductive interaction associated with interpersonal conflict that they also avoid the challenges of socio-cognitive conflict, the online environment may prove to be impoverished because it promotes only limited forms of educational dialogue. Chapter 7 therefore investigates how groups of learners harness the affordances and avoid the constraints of asynchronous dialogue in order to build knowledge together over extended periods of time.

7 Co-construction of knowledge over extended periods

Chapter 5 considered how groups of learners in asynchronous environments build links across postings to construct shared knowledge over short periods of time, and demonstrated that they employ collaborative dialogue to do this. Chapter 6 went on to show that, over extended periods, the groups employed a combination of cumulative dialogue and silence both to build knowledge together and to avoid unproductive interaction. In neither case was there evidence of learners engaging in exploratory dialogue, in which reasons and explanations are made explicit where necessary and all participants make critical evaluations in order to reach joint conclusions.

These findings agree with the literature focused on online dialogue (Littleton & Whitelock, 2005; Wegerif, 1998), which suggests that asynchronous learning dialogue tends to be cumulative in nature and that 'conferencing lends itself to the collective combining of diverse sources of information and ideas' (Coffin, North, & Martin, 2009). Research therefore suggests that exploratory dialogue is either too risky or too time consuming to be used by online groups of learners. This is a potential problem, as this is a form of dialogue 'essential for successful participation in "educated" communities of discourse' (Littleton & Whitelock, 2005, p152), and so online learning environments may be impoverished if they do not support its use.

Chapters 5 and 6 also identified challenges linked to the use of asynchronous dialogue by learners, including the need to prioritise and synthesise ideas and information, making

them easily accessible within a mass of preserved dialogue. These challenges could be expected to increase over time as the conference archive grew in size.

Taking these findings into account, this chapter examines how groups of learners utilise and preserve elements of asynchronous dialogue over weeks or months to develop shared knowledge. In order to do this, it addresses the research question

- How do groups of learners preserve and utilise elements of asynchronous dialogue over periods of weeks or months in order to develop their understandings?

To answer this question, it utilises the concept of improvable objects (Wells, 1999); artefacts that both provide a focus for progressive discourse and simultaneously embody the progress made. The literature described in Chapter 2 suggests that if groups of learners are to improve the understanding of every group member it is important that they engage in progressive discourse, which involves the use of exploratory dialogue and is likely to be inspired by and focused on the development of one or more improvable objects (Mercer & Littleton, 2007; Wells, 1999). These objects can be used to transport ideas and arguments through time and to display a group's current understanding to others.

This chapter considers whether the concept of an improvable object which inspires progressive discourse is meaningful in an environment in which text-based contributions are the norm, where exact quotation of previous turns is easily achieved, where all input is automatically stored and, consequently, every turn in the dialogue could potentially be defined as an improvable object. It goes on to investigate whether such objects are constructed and negotiated by asynchronous groups of learners and whether they promote the development in these environments of exploratory dialogue, as well as of progressive discourse. It then goes on to discuss how these forms of dialogue and improvable objects support the development of shared knowledge over extended periods of time.

7.1 Data set

In order to investigate how learners preserve and utilise elements of asynchronous dialogue over weeks or months to develop shared knowledge, this chapter analyses a data set in which groups of learners work together on meaningful problems in an online environment over extended periods of time. It makes use once again of the conference data produced by the Jet, Pearl and Sapphire project groups, but this time the focus is on the documents attached to their conference postings as well as on those postings.

These attached documents were of interest because they appeared to have the potential to be employed as improvable objects. In addition, as previous studies of conference postings had shown no evidence of exploratory dialogue, it seemed reasonable to extend the search for exploratory exchanges in asynchronous environments by considering attached documents, because earlier studies had not examined these in any detail.

The online conferences were found to resemble icebergs in that the bulk of each of them was hidden from the view of a researcher who studied only the conference postings. Pearl, for example, contained over 86,000 words, of which only 22% appeared in the postings. The other 78% were all in the associated attachments: documents produced in Microsoft Word, Microsoft PowerPoint, Adobe Acrobat and SPSS and then attached to conference postings for other group members to download, read and consider. In many cases, these attachments were different versions of the same document. Pearl group, for example, produced 17 iterations of their 'Transcript' document. Together, these versions of just one document had a word count greater than all Pearl conference postings combined.

Figure 14 (below) shows the number and variety of documents attached to postings in each of the three conferences. Of these documents jointly authored by the groups, three can be considered to be assessed assignments. In common with all other project groups on the course, Jet, Pearl and Sapphire group members spent their first week of collaborative work

developing their research proposal by completing a project proposal form. Figure 14 shows that Jet group produced 22 versions of the PPF, and that these versions were posted by six of the seven students in the group. Similarly, Pearl and Jet group produced 11 versions of the form and every student in the group posted at least one of these versions. These proposals, one for each group, were then submitted to external evaluators for assessment, comment and ethical approval.

	Jet (7 students)	**Pearl (4 students)**	**Sapphire (5 students)**
Project proposal (PPF)	22 versions by 6 students	11 versions by 4 students	11 versions by 5 students
Transcript	16 versions by 6 students	17 versions by 4 students	*N/A*
Presentation	7 versions by 3 students	6 versions by 1 student	7 versions by 2 students
Abstract	6 versions by 5 students	7 versions by 3 students	*N/A (incorporated within presentation)*
Analysis	9 versions by 4 students	13 versions by 4 students	7 versions by 4 students
PowerPoint	*N/A*	*N/A*	4 versions by 2 students
Score-sheet	*N/A*	*N/A*	6 versions by 5 students

Figure 14: Number of versions of each attachment authored by Jet, Pearl and Sapphire, together with the number of students posting versions of that document.

During this first week, working on these project proposal forms provided group members with opportunities to develop appropriate working practices, to become used to working together asynchronously, to working on and sharing responsibility for a single document

and to reaching consensus as a group. They then spent a month working together without any immediate assessment requirements until their final week of working together, when they were required to submit a jointly produced abstract and presentation. These documents had to be produced to meet course deadlines and group members were aware that they would be considered and commented on by staff and students from other groups.

Between working on these assessed assignments, the groups worked on documents that were directly relevant to their research projects. Jet and Pearl groups were analysing video data, so produced many versions of their video data transcript. At the same time Sapphire group members were developing an experimental project that involved showing a PowerPoint presentation to their subjects and then recording what they remembered of it. They therefore did not produce a transcript, but worked on their PowerPoint and score-sheet. All three groups produced several iterations of their analysis. The Sapphire analysis was presented using the statistical analysis software SPSS, whereas Jet and Pearl produced their qualitative analysis in Microsoft Word.

Because the focus of research in this chapter is on the co-construction of knowledge over extended periods of time, all three conferences were analysed over a six-week period – taking into account every posting and attached document from the opening of the conferences until they were last accessed by a student several months later. However, Crook (2002) stresses that 'because the computer-mediated collaboration is likely to be relatively unfamiliar, some care is needed in configuring it for study. In particular, observations should not be made at a point where the experience is still novel' (p67). This was an important concern; because the analysis reported in Chapter 5 identified reasons why newly formed groups working to tight deadlines might confine themselves to the use of cumulative dialogue.

The analysis presented here therefore focuses on the transcripts of video data which students in Pearl and Jet groups produced as part of their research project. It employs these groups of documents as exemplifications of broader patterns in the data. Pearl group transcripts had a total word count of 23,577 (compared to a total word count of 18,995 for Pearl conference postings). Jet group transcripts had a total word count of 12,925 (compared to a total word count of 84,530 for Jet conference postings). These video transcripts were produced in the middle section of the project group work, a more relaxed period than the frantic activity around the deadlines in the first and sixth weeks. When the groups began work on these transcripts they had already established working relationships while producing their project proposal form and so they were familiar with working together as an online group. At the same time, they were motivated to work together because their research project could not be completed until they had transcribed their data.

An additional benefit of presenting detailed analysis of these transcripts produced by the two groups was that they were directly comparable documents. Jet and Pearl groups were similar in many respects: they were working on the same presentation of the same course, using the same software and supported by the same tutors. They had had broadly similar experiences when they began work on these data transcripts and they were working to the same deadlines on very similar projects. Both groups were researching the psychology of communication and both groups had chosen as their data one of a set of video-clips supplied to each student on CD by the university. Studying the two groups' work on their transcripts thus increased the dependability of the resulting analysis.

Study of the data transcripts has the added advantage that these documents functioned as considered and thoughtful displays of the understandings of individuals and of the groups at different points. They therefore provided more detailed evidence of the development of shared understanding than would be available from spoken data, because they included both the application and the detailed exposition of these understandings. In some cases,

document authors produced direct and detailed comparisons of the views of individual group members; with the explicit aim of synthesising these to produce shared knowledge that could be agreed and accepted by the group as a whole.

7.1.1 Production of video-data transcripts by Jet and Pearl

Although Jet and Pearl students did not face the challenge of sourcing or producing the videos they were studying, both groups quickly realised that they could not analyse their data without first producing a transcript of their chosen video. In the context of improvable objects, the development of this data transcript was a real and meaningful problem for them, which they had identified as important and which they worked on for two or three weeks. Although few groups of online learners produce a video-data transcript together, most such groups can be expected to consider material in detail and to develop their understanding of that material together, so the development of the two video-data transcripts can be considered as specific examples of a frequently enacted process.

Unlike the groups' required assignments, the video-data transcripts produced by Jet and Pearl remained part of their work in progress, part of the process rather than its product. Like most students, group members were constrained by their course timetable, however because they had no set deadline for the completion of the video-data transcripts, and these transcripts were not directly assessed, they had both time and flexibility to develop these documents in a variety of ways.

The transcription of video data at first appeared to be a routine task, but learners in both groups soon found that this was not a straightforward stage of the analysis, that the communication in their video clips had many elements, and that their research question influenced their choice of elements to be recorded in detail. The transcripts produced by the two groups focused on the words exchanged within the video data, but also took into

account elements such as voice-over commentary, timing, gaze, sounds, body language and camera angles.

Over a two-week period, Pearl and Jet groups each produced numerous versions of their data transcript. Members of Jet group posted 16 versions of their transcript and members of Pearl group posted 17. In both cases, some of these were duplicate copies but the majority were different from each other. The analysis takes into account not only these documents, but also the associated conference postings, reports of synchronous chat relating to these documents, and subsequent reference to these documents. In addition, although analysis of these two transcripts is presented as an exemplar, it is informed by a more extensive analysis of the other postings and documents in the three conferences.

7.2 Data presentation

Distinguishing the various versions of the video data transcripts in order to facilitate analysis presented a problem. In some cases, members of Pearl or Jet attached the same version of the transcript more than once. In other cases, a student attached two or three versions of a transcript to the same posting. One transcript was shared in the text of a posting, rather than as an attachment, and another version never took on physical form because group members agreed to work with the same set of changes, but never produced a version that incorporated these.

In this chapter, versions attached to or incorporated within separate postings are given separate numbers even when the text they contained was identical. For clarity, a list of transcripts, their authors and their key features forms Appendix D. Jet transcripts were numbered consecutively 1-16. In the case of Pearl, versions of a transcript attached to the same posting were each allocated the same number and distinguished by ‘a’, ‘b’ or ‘c’. Pearl transcripts were therefore numbered consecutively 1-13, with Transcripts 6 and 13 both having ‘a’ and ‘b’ versions, and transcript 7 having ‘a’, ‘b’ and ‘c’ versions.

Members of Jet began their dialogue about the video-data transcript on 21 November, at the time when details of their research project proposal were being finalised, and completed this dialogue on 4 December. The video clip they selected for study ran for 3 minutes 17 seconds and showed a group of young women talking. It also included input from a teacher and a voiceover commentary.

Members of Pearl began a dialogue about their transcript on 21 November. They attempted to end this dialogue on 6 December, but confusion about the final version of the transcript resulted in the discussion being extended until 16 December. Their video clip lasted for 5 minutes and 5 seconds, and showed two interactions between a doctor and a patient. Like the Jet video-clip, it contained a voiceover commentary at some points.

The images of data contain elements of the video data examined by Jet and Pearl groups. All participants in the videos had consented to their discussion being analysed by Open University students. The images include 'invisible' elements of the attached Word documents, including spaces and tab marks, as these are relevant to the analysis. They also show the wavy red underlining with which Microsoft Word indicates possible spelling mistakes, and the green wavy lines with which it indicates possible grammatical errors whenever the authors of these documents had set their software preferences to display some or all of these elements.

The analysis also takes into account temporal aspects of the postings that were recorded in the message histories and in the document information associated with attachments. The FirstClass software automatically recorded the message history of each posting: including information about who downloaded any attachments and when they did that. These message histories were not automatically presented when a posting was opened, but they could be viewed by anyone with access to the conference. These temporal elements of the data aided analysis of how a group's shared understandings develop over time.

7.3 Improvable objects in asynchronous dialogue

If, as in face-to-face environments, the development of understandings over time is supported by the use of improvable objects, it is important to discover which artefacts in an asynchronous environment can be employed to serve this function. As outlined in Section 2.20, Wells (1999) categorises something as an improvable object if it:

- is a knowledge artefact that participants work collaboratively to improve
- involves a real problem that requires discussion
- provides a means to an end, rather than being an end in itself
- acts as a focus for the application of experience
- acts as a focus for the application of information
- inspires and focuses a progressive discourse.

These features of improvable objects combine to establish them as a means of sharing and building ideas over time, making them sites for the display, comparison, manipulation and development of different understandings. In Sections 7.3.1 to 7.3.4 below, these features are discussed in relating to the documents attached to conference postings.

Learners in asynchronous environments may have access to a wide range of similar or identical artefacts. For example, members of Jet and Pearl groups each had access to the same course materials: including books, CDs and folders. At some point, each of these would have functioned as an improvable object for its authors, creators and editors. However, by the time these artefacts reached the asynchronous learners, they retained only limited characteristics of an improvable object: they could act as a focus for discussion and they could inspire discourse that would lead to the generation of new understandings. Without being retyped, or the use of a time-consuming mail or courier system, they could not be employed as artefacts that the learners would work together to improve, and

students were not required or encouraged to use them in such a way. Instead, each of these items performed the functions of an improvable object that had taken on a stable form and was not currently available for improvement: they displayed and shared some of the understandings generated during their production. They could be described as inscriptions; but the immutable quality of inscriptions suggests they are fixed forever, whereas these artefacts retained the potential to become improvable objects once again, for example if a book were revised or video material re-versioned. Such items are therefore described here as 'preserved understandings' because they have been improvable in the past and they may be again in the future, but they are not currently available for improvement.

The distinction between preserved understandings and improvable objects lies in the permanence of their form. A book functions as an improvable object while it is being written. Authors, collaborators, editors, publishers, critics and friends can all discuss, rework and develop the understandings within the book and can also change its content, layout and design. Once the book is printed, it becomes a preserved understanding, a tool utilised by an individual or a group in an attempt to preserve their current understanding for the use of others (see Section 1.2). Its readers can still discuss, rework and develop its understandings, they can scribble notes on each page of a copy or tear it to pieces, but the content, layout and design of the other copies remains unaltered. However, a preserved understanding has the potential to become an improvable object once again, as when a book is revised or a new edition is produced.

In the case of conference dialogue, as discussed below, some attachments can be considered to be preserved understandings because they are provided as resources to aid understanding, rather than as works in progress. In the case of Pearl, Jet and Sapphire, these resources included journal articles and course guidelines. The CDs of video clips used in Pearl and Jet groups also functioned as preserved understandings for the learners on the course.

These CDs also demonstrate how preserved understandings can be used to move shared understandings over time into new contexts where they can be reinterpreted. The material in the CDs presented members of Pearl and Jet, as well as other students on the course, with a complex blend of understandings developed at different times by a variety of groupings.

The video clip of young women talking studied by Jet group showed a group of school students trying to develop an understanding of language use in the context of the understanding of language use presented by their teacher. The understanding constructed by the students and the teacher was then developed by the video-makers and narrator who produced the video clip, before being taken up by an Open University course team, and combined with video clips of very different events, to generate fresh understandings of the psychology of communication. When members of Jet group viewed this clip, they were therefore presented with a combination of the understandings of teacher, school students, video-maker, narrator and course team as well as other, underlying understandings of the nature of education, communication, psychology and meaning. The subsequent discussion by Jet group demonstrated that only a small fraction of the understandings shared and displayed in this short video-clip were immediately accessible to individual learners, and that learners did not automatically interpret its meanings in the same way.

Course materials such as books and CDs focus discussion but are unlikely to be employed as improvable objects by learners because their form is not available for change. Asynchronous learners are particularly unlikely to use material artefacts in this way because they are not co-present in time or space, although they can make use of them as preserved understandings.

In asynchronous environments, individual postings have more potential for use as improvable objects and, indeed, some postings meet many or most of Wells' parameters

outlined above. Postings that are taken up, quoted and re-quoted, commented on and reposted come particularly close to being improvable objects. As Chapter 5 showed, it is in these ways that ideas and experiences are transferred across short sequences of postings and periods of time. However, the sequences of text that are reworked in these postings cannot be considered to be knowledge artefacts that participants work collaboratively to improve; learners showed no interest in working together to produce final versions of individual conference postings. Unless these sequences of text are taken up and incorporated within improvable objects, they are lost from view within hours or days. Even if they are carried forward further, there is little likelihood that they will take on a form that will allow them to survive the closure of the conference which ultimately prevents further access to its contents. The postings quoted in these chapters have only survived by being incorporated into an improvable object in the form of a developing doctoral thesis.

To carry ideas and understandings over extended periods of time, tutors and learners in asynchronous conferences use attachments: files created in a variety of different programs which are attached to individual conference postings, just as, in other circumstances, they might be attached to individual emails. Anyone opening a posting can choose to download its associated attachments, although they will not be able to access the contents of these without access to the appropriate hardware and an appropriate version of relevant software.

Some of these attachments can be considered to be preserved understandings. For example, the tutors in Jet, Pearl and Sapphire attached the same three pages of presentation guidelines to a posting. There was no suggestion that learners should seek to develop these guidelines; it was understood that their form was fixed for the duration of the course. The first page of the guidelines clarified that they were a ‘quick guide to presentations … to help get you started’. Likewise, Pearl student Rita attached the abstracts of 14 journal articles for possible use in their literature review. Again, there was no implication that the learners should edit or rewrite these articles; she presented them as ‘articles that I found

that have relevance to what we want to research'. They were provided as resources to aid understanding, rather than as works in progress.

The majority of knowledge artefacts available to the students therefore did not function as improvable objects in this setting, although many were used as preserved understandings. However, attached documents authored by the learners had the potential to function as improvable objects because they were reworked and rewritten by group members over extended periods of time.

An attachment that functions as an improvable object should be capable not only of moving ideas and understandings across extended periods of time for group members, but also of displaying the group's combined understanding to a fresh audience. The following sections focus on the transcripts of video data produced by Jet and Pearl, examining whether attachments authored by learners function in this way, by considering whether these documents met the parameters outlined by Wells. In the first place, they needed to be knowledge artefacts that participants worked collaboratively to improve because they involved a problem that required discussion and because they provided a means to an end.

7.3.1 Real and meaningful problems in attached documents

As shown in Figure 14 (above), Jet, Pearl and Sapphire conference groups each produced five or more documents serving as knowledge artefacts that group members worked collaboratively to improve. All began by producing a project proposal form. This was not a hypothetical problem; it was a plan for real research that the groups carried out in subsequent weeks. The video transcripts on which analysis in this chapter focuses were thus not unique examples of documents which presented real problems and on which groups worked for extended periods of time, but were typical in that they appeared in multiple versions, produced by the majority of students in a project group. Members of the groups returned to these documents over extended periods of time. They planned,

sometimes weeks in advance, to produce them; they asked their tutors to archive a copy of the agreed versions for easy access, and they occasionally returned to them after a period of weeks or even months.

The groups worked together on these documents and appeared to be using them as improvable objects. However, they could have produced versions with little reference to each other, or with each group member was working in isolation on a different section of the same document. If the learner-authored attachments were used to build knowledge together over time, it was the ways in which the versions were produced and learners' understanding of what they were doing, rather than the number of versions, which were important. If these documents functioned as improvable objects, they would have been used to focus the application of relevant information and experience.

7.3.2 Application of experience in attached documents

In the case of the video-data transcripts, the documents prompted students to comment explicitly in conference postings on their experience of transcript production. This exchange of experience was employed in several ways. Several students used it to share effective methods of reviewing the video-clip and writing the transcript. These suggestions differed from those proposed by tutors because they had a reflective element, and related to work on a specific transcript rather than on transcripts in general.

Tutor Joanna suggested to students that they 'really need to get cracking on this, because it takes a surprising amount of time to finalise the transcript and analyse the data.' Student Rita in Pearl group drew on her experience to make a similar point, but she was more specific about exactly how long it took to transcribe a five-minute video clip. Her experience allowed her to build connections with other group members by empathising over the time spent on this task: 'the initial transcript and adding the NVC [non-verbal communication] took me about 6 hours and I know how hard it is to keep going.'

Rita's comment indicated how much work individual learners put into producing versions of the transcript. She had evidently invested considerable effort in adding non-verbal communication to her version and this gave those elements additional implied value that would make it difficult for other group members to remove them at a later point.

Other students drew on their experience of working on the transcript to reflect on what had been done and what remained to do, thus linking their personal experience to the development of this document. In the posting accompanying Jet Transcript 8, Glenn explained: 'I've highlighted the supporting noises as a bold and underline. Maybe we need to put more in here – maybe the sort of noise and the numbers of supporters should be added as a comment alongside the text?' These are relatively sophisticated additions – the authors of earlier versions of the document focused on the speech of individual participants. It was Glenn's experience of revising the transcript that drew to his attention both the background comments and the difficulty of representing these adequately.

Students also drew upon their experience to improve their transcript by sharing techniques and methods of carrying out the work. They were not concerned with the production of generalised statements about the best way to produce a transcript; instead they focused such comments on particular versions of the document.

Olivia advised other members of Jet group that 'this was the easiest way for me to do it, just keep going back over and over adding and changing. Found it really difficult to separate the voices when all chatting so maybe concentrate on that?' Once again, the experience of working on the document inspired suggestions as to how it might be improved in the future. At the same time, sharing experience in this way served to bind the group together as a collaborative unit. Each member gained a sense of what others were doing, how they were doing it, and how much time it was taking them. They were thus able to compare their workload and progress with those of other group members, and to identify

ways in which they might be able to contribute to the future improvement of the transcript. This sharing of experience was supplemented by information sharing that supported the learners in developing and understanding their data transcript.

7.3.3 'Application of information' in attached documents

As they worked together on the production of data transcripts, members of Jet and Pearl gradually became aware that the dialogue they were studying was not composed solely of tidy sequences of spoken conversation; it was a messy affair involving intonation, sounds, posture, gaze and gesture during which several people made contributions at the same time. They also came to realise that others, including the narrator and video-makers, mediated their understanding of these dialogues.

To represent some, or all, of these elements in a sequential text is not an easy matter, and the groups needed to find ways of prioritising and representing them. The first explicit suggestion as to how this could be done by Jet group came from Eileen, who cited part of the group's course material and suggested the use of italics and square brackets to identify non-verbal communication. The next day she suggested a more detailed set of conventions used by Janet Maybin in a book chapter reproduced within the course materials (Maybin, 2003). This chapter had been cited by the group in their earlier literature review as a source of ideas about children's informal talk. The experience of producing the transcript led Eileen to see how Maybin's work could provide useful support for the transcription process, and she passed this information on to the rest of the group.

This, in turn, led to an even more practical exchange of information. Maybin's approach required the use of a long bracket, which could overlap two or more lines of text to indicate overlapping speech. It also required the introduction of line numbers. No group member had sufficient familiarity with Microsoft Word to allow them to do these things easily. Maggie consulted her mother, an editor, and relayed what she said to the rest of Jet group.

However, it took another five days and another five versions of the transcript for the group to share sufficient information to allow them to produce a document in which the numbers and brackets were aligned to aid comprehension of the transcript.

Pearl group members also needed to find a way of representing overlapping speech. Unlike Pearl, they had not referred to the Maybin article in their literature review, but to another article reprinted in their course materials (West, 2003). Working on the transcript prompted Ethan to return to this article and to share information about what he found there:

> You may want to look at the West offprint. She puts overlap in conversation in brackets [xxxx] and in different lines. I thought it a good method. She also puts body lang in double brackets ((xxx)) – another good coding we could use I think.

In both groups, working on the transcript provoked a return to and re-evaluation of information sources already accessed by the group. Previous conference dialogue had demonstrated little understanding of why studying the work of West and Maybin could be valuable for investigations of video data. The need to solve practical problems thus increased groups' understandings of the literature they had read.

Analysis of the discussion around the video transcripts shows that attached documents created and developed by groups of learners can act as a focus for the application of both information and experience. When participants work collaboratively to improve such documents, in order to solve a real problem that is meaningful to them, the documents can be defined as improvable objects because they meet Wells' criteria (1999). They can therefore be expected to play a significant part in the development of progressive discourse in which learners work toward common understanding satisfactory to all, frame questions and propositions in ways that allow evidence to be brought to bear on them, expand the body of collectively valid propositions and allow any belief to be subjected to criticism if it will advance the discourse (Bereiter, 1994). Such dialogue, in a face-to-face setting, would commonly involve the use of exploratory dialogue.

7.3.4 Attached documents as a focus for progressive discourse

To investigate whether attached documents developed by learners do inspire and focus progressive discourse, including exploratory exchanges, this section examines the understandings displayed by learners in Jet and Pearl before, during and after they had discussed and developed their video transcripts. These understandings show signs of change and development and there is evidence that this was the result of progressive discourse inspired by improvable objects, in which sharing, questioning and revising of opinions leads to new, improved understanding for all participants.

When Jet group first formed, its members spent a week discussing their research design before they formally agreed to carry out a study of a video-clip of young women talking and to focus their study on the question, 'How do participants in a group use verbal and non-verbal communication to construct meaning?' In order to answer this question, group members decided that they must work together to produce an agreed transcript of the video data and, consequently, they began to add versions of this transcript to some of their postings in the form of attachments. To clarify the analysis, these versions are here numbered consecutively as outlined in Section 7.2 above.

Despite the different headings given to them by their authors, Figures 15 and 16 (below) both show the first lines of Jet Transcripts 1 and 2 of the same video clip. These documents, produced by students Olivia and Heather, were the group's first attempts at representing their video data in the form of text and at framing propositions about that data in ways that allowed evidence to be brought to bear on them.

The message histories show that each version was produced without reference to the other and they therefore represent the two authors' different understandings of the elements of the video clip relevant to their research as they began work on their agreed project. The postings to which these transcripts were attached made it clear that the authors expected

others to build on their work. Olivia described her transcript as 'first attempt and very basic, prime for you to write over and change' and ended her posting, 'Passing on the baton to whoever wants it next!' When Heather posted her version the next day she wrote 'Hope it is of some use, interesting to compare mine with Olivia's!' From the start, these transcripts were treated as group property and as part of a continuing dialogue.

Video Clip 2

Transcript

Girl A "The,, are, coz you know my cousin, she's from Bradford now when she starts talking I start copy, imitating what she's saying and she gets really angry she goes you can't talk proper, what you can't talk proper, I, it don't really mean anything, you just don't talk like me" *Leaning forward into the table, using hands animatedly, moving around in chair*

Girl B "We're forever taking the mikey out of peoples accents and what you think about it though, aren't you" *Out of view*

Figure 15: Start of Jet Transcript 1, posted by Olivia on 21 November.

Transcription of Video Clip 5

Teacher: So now coming on to the whole issue of how langauge can be used in a sexist way, language can be used to keep somebody down.

Narrator: Language and power and stereotypes about acccent and dialect are issues which Kit wants pupils to look at in more detail. He breaks the class up into small groups and this more relaxed and informal setting influences the way the girls can explore the issues.

Girl 2: Cos thats what...Cos you know my cousin? She's from Bradford, you know when she starts talking I start copy...you know, imitating what shes saying, she gets really angry and she goes 'you can't talk proper', I go 'what? You can't talk proper!' it doesn't really mean anything just, you know, you don't talk like me.

Girl 4: We're forever taking the mickey out of peoples accents though if you think about it, in't ya?

Figure 16: Start of Jet Transcript 2, posted by Heather on 22 November.

Olivia and Heather's proposals included ideas about the content, terminology and format of the transcripts. Although both transcripts dealt with the same video data, the two authors proposed different ways of approaching these three areas. Heather's content included both the voice of the teacher in the classroom, and that of the narrator who provided voice-over commentary on the video-clip. Olivia omitted both these, but picked up on some of the

non-verbal elements of the conversation. She also attempted a representation of the regional accent of one of the speakers, using the words 'in't ya' in place of the more formal 'aren't you', which appears in Transcript 1. Because she was not using the grammar and spelling checkers available in Microsoft Word, she could use variants from Standard English without the software giving them added weight by marking them for correction.

The two authors also varied in the terminology they used. Olivia considered she was analysing Video-clip 2, while Heather described the same data as Video-clip 5. Olivia's Girl A and Girl B were described by Heather as Girl 2 and Girl 4. Such seemingly minor discrepancies impacted on the acceptability and clarity of the transcript and these propositions were subjected to criticism as members of Jet group spent ten days discussing whether it was appropriate to refer to the young women in the clip as girls, or whether they should be referred to by number, letter, name or description. The initial propositions set out in Transcripts 1 and 2 thus provoked group members to discuss how to make their transcript clear, comprehensible and 'politically correct'.

From the point of view of formatting, there were both similarities and differences in the approaches proposed by Heather and Olivia. Both divided separate turns of speech by spacing, identified the speaker at the start of turns of speech and attempted to use standard punctuation. They differed, however, in their use of bold and italic, their use of colons and speech marks and their punctuation of the dialogue. These discrepancies weighted aspects of the videoed interaction in different ways. Heather gave weight to the contributions of the teacher and narrator, constructing a reading pathway that began with these elements. Olivia gave these elements no weight, and took readers straight to the girls' conversation. She separated the girls' conversational turns, framing them within descriptions of posture, gesture and camera angle, content which had been missing from Heather's account. The video evidence supported both approaches; group members thus had to work together to

decide which elements of these approaches they believed to be most relevant to their research and they did this in subsequent postings and summaries.

Other formatting differences suggested that the group needed to return to the video evidence to determine which proposition was more accurate. Variance in punctuation showed that, even when Olivia and Heather had transcribed the content in the same way, they had interpreted it differently. In the short extracts above, Olivia's punctuation attributed 'you can't talk proper' to the Bradford cousin, whereas Heather interpreted these words as the speaker's response to the Bradford cousin.

The two transcripts illustrate that individual group members needed to build shared understanding because they began their research project with different understandings of their data and their task, and thus of what they had achieved together in the past. Olivia's transcript appears less detailed than Heather's, because it omitted the speech of the teacher and of the narrator, but it was more directly relevant to the study of the verbal and non-verbal interaction of young women that was the agreed focus of Jet group's study. This casts light on the two students' interpretation of their proposal form, the last document the group had produced together. In their 23 versions of that document they had slowly developed their research question together.

Heather's version of the transcript suggested that she did not fully understand the nature of the 'Study of young women talking' on which the group had agreed and that she had not yet related the transcription to their research question: 'How do participants in a group use verbal and non-verbal communication to construct meaning?' The final version of the project proposal had been signed off by the group and thus could be taken as evidence of shared understanding. However, extending analysis to the period in which the group made use of the project proposal shows that they continued to develop a shared understanding of the project in which they were engaged and also indicates that the level of their shared

understanding was lower than the final project proposal had suggested. Once the talk of the teacher and narrator had been transcribed, the group did not remove it from subsequent versions of the transcript, but it was gradually given less visual weight and was excluded from their analysis. While the girls' talk was given line numbers, input from teacher and narrator was left alone. Finally, it was presented in a lighter typeface than the girls' talk, so that the eye was drawn directly across it to line 1 of the girls' talk.

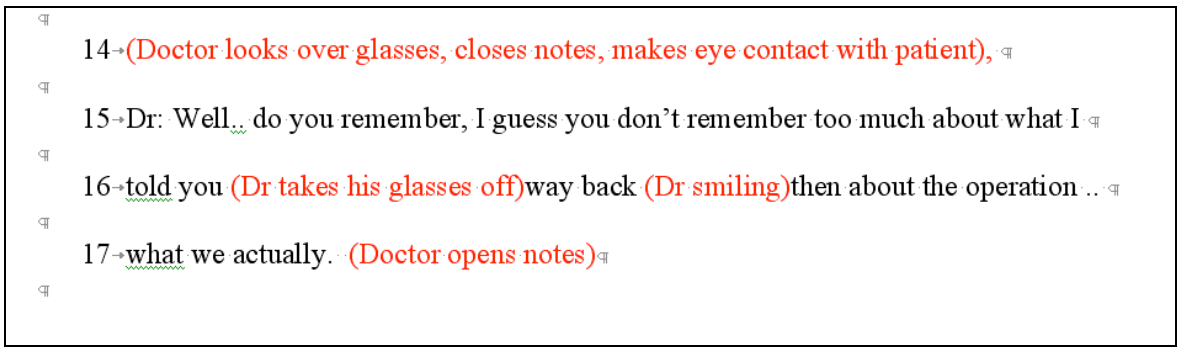
As the students began to share versions of their video transcript, their different understandings of their data and project were implicit in the documents they posted. As discussion of the transcripts proceeded, the comparison of understandings became more explicit. Both groups found it useful to set out the propositions put forward by group members in order to subject these to criticism and bring evidence to bear on them. Once they were aware of different points of view, they were able to extend their evidence base by bringing personal experience to bear on the development of joint understanding.

This was particularly evident when members of Jet group had agreed the final versions of their transcript (Appendix E) and were using this version to focus their analysis. Eileen, for example, identified three different understandings of the word 'posh' displayed by members of Jet and then made an attempt at contextualising these as regional variations in vocabulary, based on her limited knowledge of where group members lived or had grown up. Having drawn attention to the different interpretations, she moved on: 'I was going to try to defend my analysis but actually I think we are all seeing the same thing which is that she is "set apart"'. She thus advanced the discourse towards synthesis by subjecting her original belief to criticism and making it clear that, in the light of the contributions of others, she had refined her understanding of how the word was used within the video-clip.

Pearl group members carried out an investigation of 'Power and control within healthcare relationships' focused on the research question 'Do physicians seek to control

communication with their patients?' While engaged in this study, group members worked hard to frame questions and propositions in ways that allowed evidence to be brought to bear on them. In mid-December, Charlene noted that 'It has taken me 6 hours to compile a table and document that links up, line by line, all of our comments'. The 15-page document she produced was a detailed comparison of the understandings expressed by each student in the group about their data. In it, she used layout and colour to distinguish clearly between the voices of different students, and she supplemented the document with a table in which she marked whether students had agreed or disagreed on various points and interpretations. She did not prioritise selected propositions, but framed the opinions of individuals in ways that gave them equal weight. At the same time, her use of colour and the table format created vectors and reading pathways that supported direct comparison of related propositions. For reasons of space, Charlene's entire 9,062-word document is not presented here, but an anonymised version of the first two pages forms Appendix F.

This very extensive comparison of questions and propositions was too long and detailed to be possible in speech. It would also have overwhelmed a conference posting, as these are typically brief and few of those exchanged by Pearl, Jet or Sapphire were more than one screen in length. Although individuals' views of their analysis differed, the extract in Figure 18 (discussing the data shown in Figure 17) showed that group members were in the process of developing a sophisticated understanding of the transcript they had created.

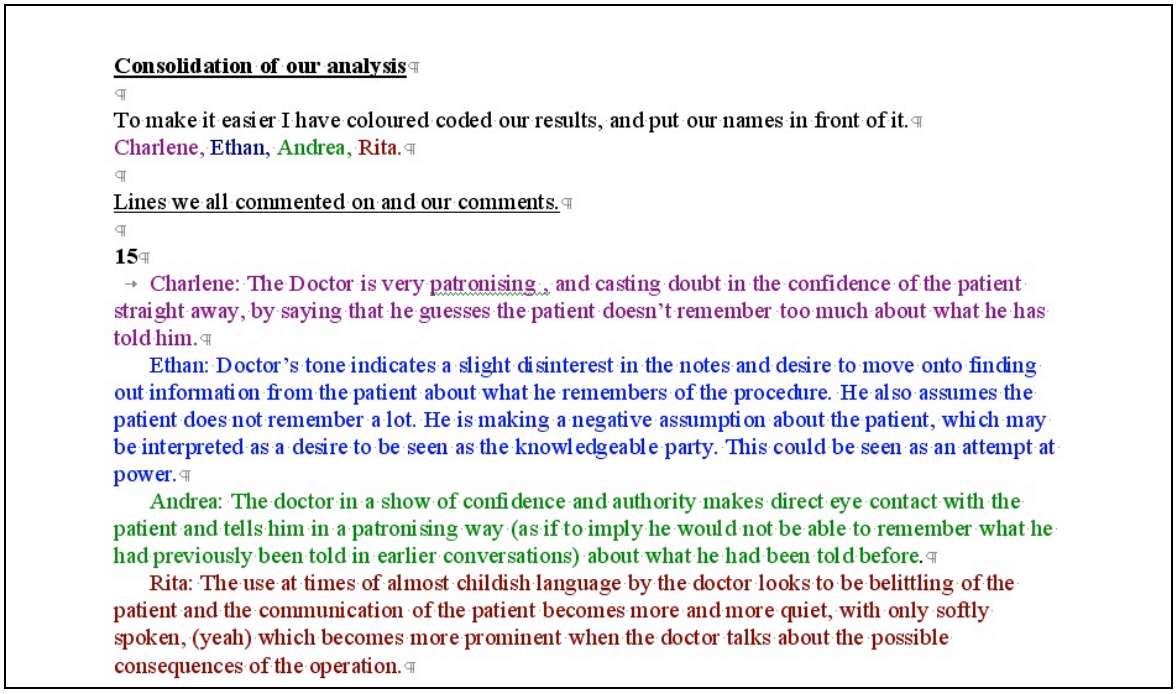

14 (Doctor looks over glasses, closes notes, makes eye contact with patient),

15 Dr: Well.. do you remember, I guess you don't remember too much about what I

16 told you (Dr takes his glasses off)way back (Dr smiling)then about the operation ..

17 what we actually. (Doctor opens notes)

Figure 17: Lines 14-17 of the agreed version of Pearl's video-data transcript.



Consolidation of our analysis

To make it easier I have coloured coded our results, and put our names in front of it.
Charlene, Ethan, Andrea, Rita.

Lines we all commented on and our comments.

15

→ Charlene: The Doctor is very patronising , and casting doubt in the confidence of the patient straight away, by saying that he guesses the patient doesn't remember too much about what he has told him.

Ethan: Doctor's tone indicates a slight disinterest in the notes and desire to move onto finding out information from the patient about what he remembers of the procedure. He also assumes the patient does not remember a lot. He is making a negative assumption about the patient, which may be interpreted as a desire to be seen as the knowledgeable party. This could be seen as an attempt at power.

Andrea: The doctor in a show of confidence and authority makes direct eye contact with the patient and tells him in a patronising way (as if to imply he would not be able to remember what he had previously been told in earlier conversations) about what he had been told before.

Rita: The use at times of almost childish language by the doctor looks to be belittling of the patient and the communication of the patient becomes more and more quiet, with only softly spoken, (yeah) which becomes more prominent when the doctor talks about the possible consequences of the operation.

Figure 18: Start of 15-page consolidation document posted by Charlene on 16 December.

This section considers the portion of video-data transcript presented in Figure 17.

Pearl Transcript 1, produced by Rita, had focused on the words spoken by doctor and patient. Since then, repeated refinement and interpretations of this transcript by different individuals had proposed the consideration of gaze (Transcript 2 by Andrea), overlapping speech (Transcript 2 by Andrea), volume (Transcript 4 by Rita), actions (Transcript 7a by Charlene) and camera angles (Transcript 7b by Charlene). By the time Charlene composed her consolidation document, all group members shared the understanding that these were important aspects of the interaction they were studying, and they displayed this understanding by making reference to these elements. Elsewhere in Charlene's consolidation document, the students drew attention to other aspects of the data of which some individuals had shown no awareness when they began work on the transcript, including posture, gesture, manner, non-verbal sounds and display of emotions.

The work done by Jet and Pearl groups in relation to their video-data transcripts showed all the characteristics of progressive discourse inspired by and focused on improvable objects.

In working on the attached documents authored by group members, they worked towards a shared understanding by framing questions and propositions in ways that allowed evidence to be brought to bear on them, expanding the body of collectively valid propositions, and allowing beliefs to be subjected to criticism in order to advance the discourse. However, the analysis has not yet demonstrated that, in so doing, they employed the exploratory dialogue that could be expected to form a part of progressive discourse in a face-to-face context. Section 7.4 examines the dialogue associated with the used of attached documents within the conferences. It distinguishes between two types of asynchronous dialogue employed by online learners, posting dialogue and attached dialogue, and demonstrates how their affordances influenced the use of cumulative and exploratory exchanges.

7.4 Dialogue associated with the use of attached documents

Jet's first versions of their video-data transcript, Transcripts 1 and 2, were developed in parallel, without reference to each other. As section 7.3.4 showed, this resulted in the display of different understandings of the group's task and data. Student Heather made it clear that she had produced Transcript 2 without reference to Olivia's Transcript 1 when she posted 'should have looked at board first but I went ahead and did a transcript too so thought I may as well post it up. Hope it is of some use, interesting to compare mine with Olivia's!' Her posting suggested that she was encouraging the use of a cumulative approach in which students would build on each other's contributions. Her fellow student, Maggie, appeared to take this approach when she shared Jet Transcript 3 (Figure 19, below) with the group and stated that she had produced her transcript both in response to the two earlier versions, and with reference to those versions: 'Heather and Olivia well done on your transcripts. I was going to wait till I got home but as you guys are already on the go I thought I too would have a go […] I have worked from your two transcripts too.'

Transcription of Video Clip 2

Class Setting

Teacher: → 1 So now coming on to the whole issue of how langauge can be used in a sexist way, language can be used to 2 keep somebody down.

Narrator: → 3 Language and power and stereotypes about acccent and dialect are issues which Kit wants pupils to look at 4 in more detail. He breaks the class up into small groups and this more relaxed and informal setting influences 5 the way the girls can explore the issues.

Girl 2: → 6 Cos thats what...Cos you know my cousin? She's from Bradford....

Girl 3: → 7 Yeh

Girl 2: → 8 .....you know when she starts talking I start copy...

Girl 4: → 9 Yeh

Girl 2: → 10 .....you know, imitating what shes saying, she gets really angry and she goes 'you can't talk proper', I go 11 'what? You can't talk proper!'

Collective laughing

Girl 3: → 12 *echo* you cant talk proper

Girl 2: → 13 .....it doesn't really mean anything just, you know, you don't talk like me.

Girl 1: → 14 *Taps pencil on table*

Girl 4: → 15 We're forever taking the mickey out of peoples accents though if you think about it, in't you?

Figure 19: Start of Jet Transcript 3, posted by Maggie on 22 November.

Maggie's misspelling of the word 'language' in the first line of dialogue in her transcript (Figure 19) suggests that she had cut-and-pasted her dialogue from Heather's Transcript 2, which contained the same error. At the same time, she incorporated italicised descriptions of non-verbal actions as in Transcript 1. Because she accepted and used Heather's transcription of the dialogue, rather than creating her own version, she was able to concentrate on elements that had been omitted in earlier transcripts. Her transcript added to the suggestions about content and format proposed by the group because she included laughter, interjections, echoes and the contributions of two more participants in the dialogue, while her format involved the use of tabulation and line numbers.

Before Maggie posted Jet Transcript 3, learners' contributions to dialogue concerning the transcript and their associated actions appear to be easily separable. Individuals acted to

develop the improvable object by producing and attaching versions of the transcript. They discussed and described these actions in a series of postings that formed an ongoing dialogue. In the case of the postings related to the first three versions of the transcript, the postings included all the features of cumulative dialogue: group members built positively on each other's contributions, adding their own information and constructing a body of shared knowledge and understanding without challenging or criticising each others' views.

The situation did not change when Maggie shared Transcript 4, as it was identical to Transcript 3 and only posted due to technical problems. However, at the point Hannah attached Transcript 5 to a posting the next day, it becomes clear that students were engaging simultaneously in two forms of asynchronous dialogue: dialogue through postings, and dialogue through improvable objects. These different forms of asynchronous dialogue have not been described previously and are described here for the first time.

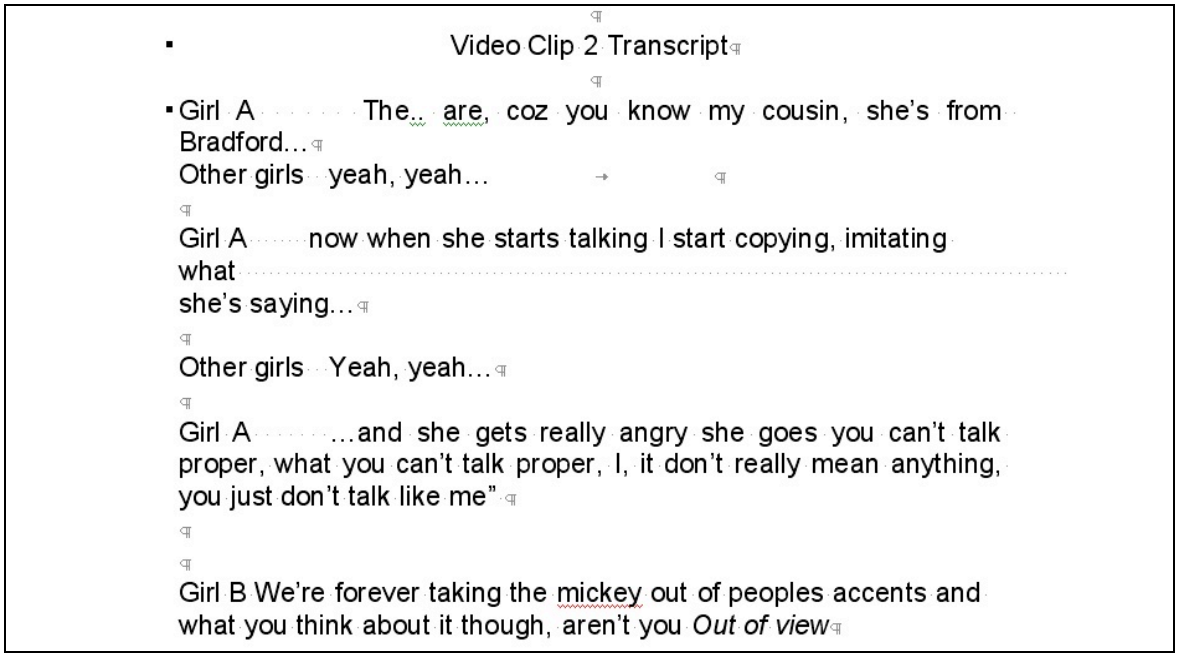
7.4.1 Posting dialogue and attached dialogue

'Posting dialogue' consists of immediately apparent exchanges in the conference postings, like those on which analysis in Chapters 5 and 6 focused. 'Attached dialogue' is carried on alongside the posting dialogue through the medium of attached documents. It includes the clear and explicit presentation of ideas, together with challenges, counter-challenges, analysis, evaluation and explanation. These two dialogues have different characteristics and affordances, but are so intertwined that it is initially difficult to distinguish them.

Posting dialogue resembles talk, in that it frequently consists of a series of conversational turns, and is thus easily recognisable as dialogue. Attached dialogue is less obvious, because sharing attachments initially appears to be a supplementary exercise that resources the posting dialogue and because many attached documents are used as resources rather than as turns in a dialogue. Nevertheless, the exchange of attached documents can be considered to be a form of asynchronous dialogue whenever it forms a sustained discussion

involving two or more people, who are not expected to be in temporal proximity, in which language is used to convey meaning.

When Hannah introduced Transcript 5 (Figure 20) the posting dialogue proceeded, as it had done previously, in a cumulative manner. Like previous authors, Hannah represented her production of a transcript as part of a cumulative process in which she built positively on the work of others. From her perspective, this was an accurate representation of what she had done in building on Transcript 1. However, her posting obscured the fact that her version of the transcript did not build on all that had gone before because, according to the message histories, she had not at that point downloaded Transcripts 2, 3 or 4. Her transcript could not build on the work of Heather or Maggie, because she had only accessed Olivia's Transcript 1 (Figure 15, above). Her interpretation of the video data therefore followed Olivia's in that she omitted the teacher and the narrator's contributions, and referred to the speakers as Girl A and Girl B.



Video Clip 2 Transcript

Girl A The.. are, coz you know my cousin, she's from Bradford...
Other girls yeah, yeah...

Girl A now when she starts talking I start copying, imitating what she's saying...

Other girls Yeah, yeah...

Girl A ...and she gets really angry she goes you can't talk proper, what you can't talk proper, I, it don't really mean anything, you just don't talk like me"

Girl B We're forever taking the mickey out of peoples accents and what you think about it though, aren't you *Out of view*

Figure 20: Start of Jet Transcript 5, posted by Hannah on 23 November.

As a result, the attached dialogue became exploratory because Hannah had, unwittingly, produced a detailed challenge to what had gone before. As the text of their postings makes

clear, individual authors were not at this point aware that they were producing challenges and counter-challenges but, nevertheless, the content of their attached documents fulfilled these functions and thus prompted the development of exploratory dialogue. Olivia and Hannah saw the words of teacher and narrator as irrelevant to the task in hand and omitted these from their documents, while Maggie and Heather made some effort to include them. There were two viewpoints, each clearly expressed, each developed in some detail and each supported by two group members. The differences in content, terminology and format between the transcripts suggested a number of areas of contention that needed to be resolved by the group before a finalised version of the transcript could be produced. Although the dialogue at this point could be interpreted as disputational, in that students were making assertions and counter assertions without attending to each other in the short term, their subsequent behaviour in developing agreed understandings about their data and their project marks this clearly as part of an extended sequence of exploratory dialogue.

Exploratory dialogue emerged in this discourse focused on an improvable object because the posting dialogue and the attached dialogue were separate, because they were textual and because they were asynchronous.

7.4.2 Separation of posting dialogue and attached dialogue

When Hannah posted Transcript 5, the message histories show that she had already opened all previous postings and can therefore be considered to have been completely up to date with the posting dialogue. However, the areas of disagreement about the content, terminology and format of the transcript had not surfaced in the postings. The significant differences of opinion about content, terminology and format had not been explored, or even mentioned, outside the attached documents. Because Hannah treated the posting dialogue and attached dialogue in different ways, she opened all postings, but delayed downloading the most recent attachments. Due to this separation of the different types of

dialogue, she was unaware of Heather and Maggie's views until after she had attached her version and therefore unintentionally presented a detailed challenge to those views.

7.4.3 Asynchronous and textual character of attached dialogue

The asynchronous nature of the conference thus allowed challenges and counter-challenges to be mounted accidentally. To avoid engaging in these characteristic elements of exploratory dialogue would have involved extra work. Heather and Maggie's transcripts were attached to postings on the evening of 22 November, with the last of these appearing at 22.52. Hannah attached Transcript 5 to a posting early the next morning. The timing of these attachments suggests that Hannah had been working on, or had completed, her transcript before Heather and Maggie attached their versions.

Turns in the attached dialogue tended to be both more widely spaced and more carefully considered than those in the posting dialogue. This resulted in learners working on turns in the dialogue at the same time as each other. The asynchronous nature of the attached dialogue thus prompted the development of exploratory dialogue. In order to avoid presenting a challenge, Hannah would have had to download and consider two additional documents and give extra thought to her own transcript before attaching it to a conference posting. Mounting the challenge involved less work and became the default position.

The transcript's status as an improvable object made it difficult for Hannah's unintended challenge to be ignored; because the group could not retain multiple versions, members had to agree on one representation of their video data. The textual nature of the challenge meant that it could not easily be overlooked. All aspects of it could be retained and considered, and the message histories show that students frequently downloaded transcript versions several times. Transcript 4, for example, was downloaded six times over a two-week period by its author, five times by one student and twice by another.

The attached dialogue also produced challenges and counter-challenges in Pearl group. Three days after group members had agreed on their transcript, Charlene posted a new version, adding 'I hope you don't mind but I sorted out the line numbers. I didn't change anything else.' Andrea posted an analysis based on the original version, while Rita posted an analysis based on the revised version. The group spent three days working out which comments related to which version, and this discussion had the positive effect of prompting both Rita and Andrea to consider comments made by tutors and each other's version, before posting revised analyses. Rita made it clear that at least some of her revisions were associated with different versions of the transcript being available: 'I hope to have taken Zoë's comments on board. There is no reference to specific lines any more.'

Such exploratory exchanges, containing challenges and worked-through responses typically took place within the attached dialogue. Only in some cases did they prompt a move towards exploratory dialogue within the posting dialogue. This was the case in Jet, where Heather, Maggie and Hannah's different interpretations of the data provoked exploratory exchanges within the posted dialogue.

7.5 Influence of attached dialogue on posted dialogue

In the case of the Jet discussion described above, the emergence of exploratory exchanges in the attached dialogue with the posting of Transcript 5 led to the subsequent emergence of these exchanges in the posted dialogue. That evening, Eileen posted a detailed evaluation of the different perspectives on content, terminology and format of which the different transcripts had made her aware. For example, she asked:

> Is it ok to call them "girls"? Wouldn't the title of the clip be: "Young Girls Talking" if so? I feel that there may be an issue we should discuss - though I would agree that the transcripts will be more wordy. Can we work out their names from the way they address each other? and anyone we don't know we could call "3rd person" or something?

Olivia responded a few minutes later: 'I wondered about naming the girls but couldn't do all of them so thought it might be more consistent to letter them instead?' Half an hour later, Hannah suggested (Figure 21) 'Or call them participants?' In the subsequent discussion, group members explored these perspectives in more depth, returned to the literature to investigate how other researchers had dealt with format, and considered why elements of the transcript should be included or excluded.


From: Hannah Pseudonym

Subject: Re(2): Transcripts

To: DZX999 Jet

Date: Friday 24 November, 2006 10:14 AM Message history

Olivia Pseudonym writes:

Eileen Pseudonym writes:

A few things occured to me as I read them:

1. My personal preference would be to **follow the conventions** in Methods Booklet 4, i.e. in pages 49 on. There are square brackets and italics used for descriptions of non-verbal behaviour. The line numbers are at the right hand margin. It may be better to number the lines later after we have added all the non-verbal stuff. It is called "Transcript" and there are full stops at the end of lines.

I agree, I put the non vrbal bits in italics put not the brackets . ., forgot the line numbers but they need to be put in.Yes, I forgot line numbers too! I agree re non verbal stuff too

2. Is it ok to call them "girls"? Wouldn't the title of the clip be: "Young Girls Talking" if so? I feel that there may be an issue we should discuss - though I would agree that the transcripts will be more wordy. Can we work out their names from the way they address each other? and anyone we don't know we could call "3rd person" or something?

I wondered about naming the girls but couldn't do all of them so though: it might be more consistent to letter them instead? Or call them participants?

3. Do we leave the narrator in? Will we be analysing that part? (presumably not because it is scripted). Does it add anything to the Transcript? (I don't think so).

Personaly, d cnit think the narrative was relative Neither did I but I guess as it's been done would it hurt to leave it in?

Hannah

Reply | Reply with quote | Forward

Figure 21: Discussion about the Jet transcript. Large text is contributed by Eileen, small text by Olivia and blue text by Hannah.

When exploratory dialogue appeared in the postings, students were able to use quotation and variations in point size, colour and shading to develop it in some detail, as in Figure 21. These elements were used to weight the input of different participants in different ways

and thus create clear reading paths through the postings, in this case distinguishing two sets of previous, shaded comments from the new material that was coloured blue. The use of these typographic features allowed the characteristic elements of exploratory dialogue – active participation, justifications, alternative views and visible reasoning – to be interwoven in one posting and used to inform future versions of the improvable object.

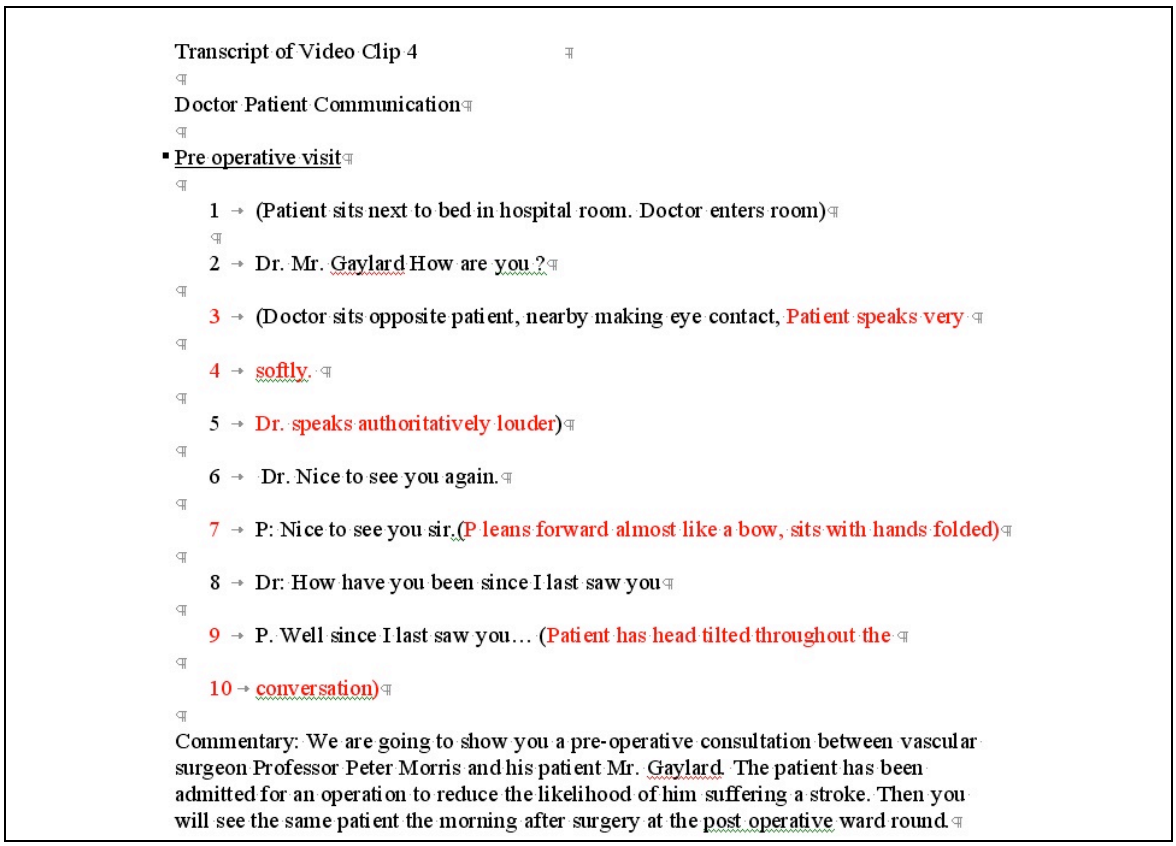
Active participation is seen in that Olivia, Eileen and Hannah were all involved in the developing conversation, and their contributions could be distinguished due to the use of colour, point size and formatting. When Eileen asked in the text that appears here as larger whether the participants could be called by their names, Olivia justified her position in the text that appears here as smaller by explaining that she did not know the names, and had opted for the word 'girls' for consistency. All three put forward alternative views about this. Hannah's opinion, in blue, can be clearly distinguished from the earlier suggestions. Thus the reasoning of all was visible at the same time. The numbering of the different points allowed the discussion of three different issues to continue at the same time, with different results. All three agreed that the transcript needed to have line numbers, they agreed that the words of the narrator were not relevant but were unsure whether to remove them or not, and they failed to agree about how to refer to the young women in the video.

Exploratory dialogue in Jet originated in the attachments and subsequently appeared in the postings. In Pearl, the posting dialogue remained cumulative but exploratory dialogue took place through attachments presenting different interpretations of the transcript. Different approaches emerged because active development of improvable objects in an asynchronous environment necessitates the use of some features of exploratory dialogue. Versions of the same document produced by different authors require active participation, they offer statements and suggestions for joint consideration, put forward different approaches, present challenges and are likely to take other opinions into account. These features can be supplemented with use of typographical devices and comments that distinguish areas of

agreement from those that remain problematic. Exploratory dialogue can be transferred to the posting dialogue, as shown above in the case of Jet, or developed within the attached dialogue, as Pearl group does in Figures 22 and 23 (below).

Figures 22 and 23 show Pearl students foregrounding the use of exploratory dialogue in their attached documents. The response time within attached dialogue is considerable (see Appendix E for details of response times related to the Jet and Pearl transcripts), resulting in a staggered form of communication. Ethan's Transcript 8 (Figure 23) was a response to Transcript 4 (Figure 22), contributed by Maria a week earlier, rather than to the transcripts that made up the intervening turns in the dialogue. In Transcript 4, Maria introduced body language after being prompted to do so by the group's tutors. She drew attention to this in the posting dialogue with a statement that formed part of the ongoing cumulative dialogue: 'I have added as much body language as I could find. Could someone please check, as I am sure I have missed some.'

When Maria contributed Pearl Transcript 4, the attached dialogue also appeared to be cumulative. By highlighting her additions in red, Maria drew attention to the ways in which her version built on and developed the previous version. A week later, Ethan's response built on Maria's work, but was more exploratory in nature. He used colour in a new way, not only to frame and distinguish different elements of the transcript as Maria had done, but also to distinguish the different voices of its authors. He preserved Maria's text in black and red and added his own material and comments in blue. This allowed him to engage in exploratory dialogue. In most cases, he added to or amended Maria's version without comment. However, when he removed the word 'authoritatively' from Maria's version, he presented this as a challenge to her interpretation because he not only drew attention to its removal, he also gave an explanation of what he had done, noting in blue that he had removed the word because he considered it subjective.



Transcript of Video Clip 4

Doctor Patient Communication

- Pre operative visit

1 → (Patient sits next to bed in hospital room. Doctor enters room)

2 → Dr. Mr. Gaylard How are you ?

3 → (Doctor sits opposite patient, nearby making eye contact, Patient speaks very

4 → softly.

5 → Dr. speaks authoritatively louder)

6 → Dr. Nice to see you again.

7 → P: Nice to see you sir.(P leans forward almost like a bow, sits with hands folded)

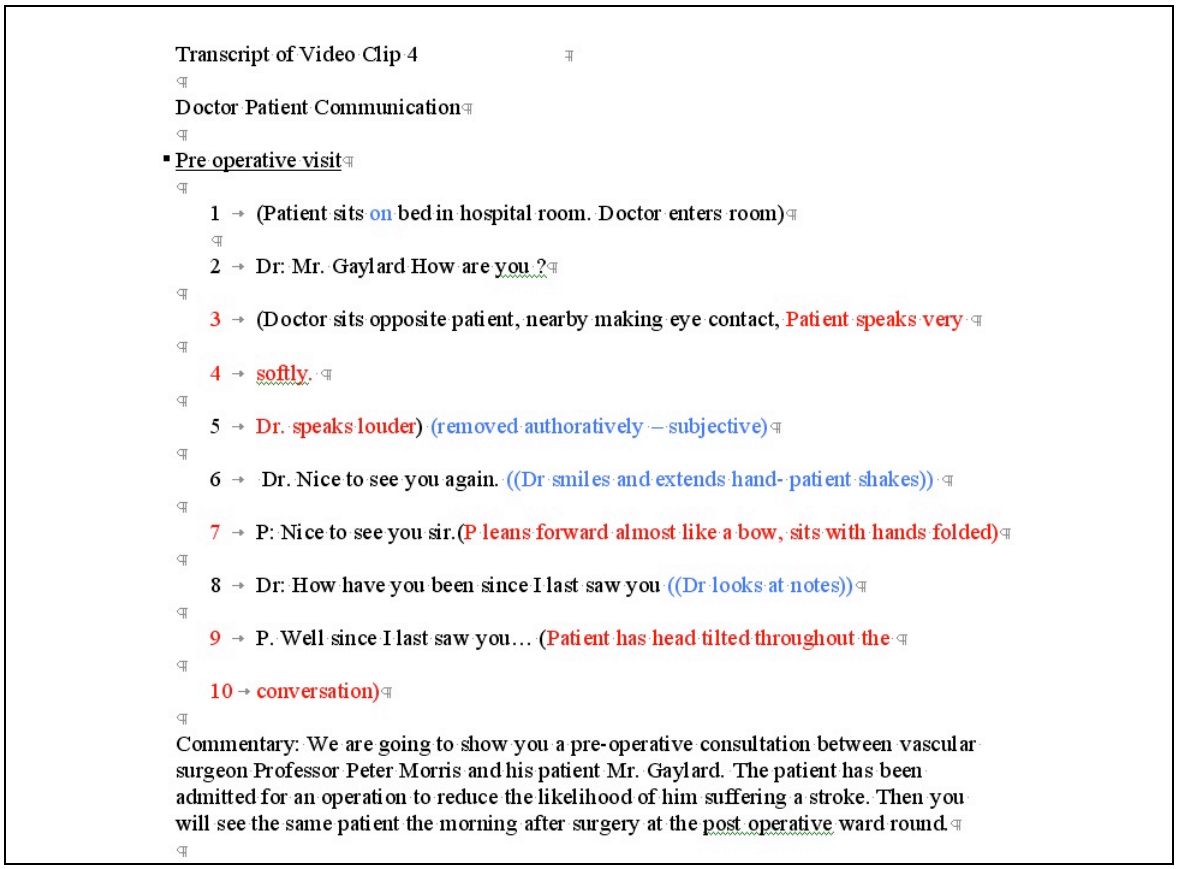
8 → Dr: How have you been since I last saw you

9 → P. Well since I last saw you… (Patient has head tilted throughout the

10 → conversation)

Commentary: We are going to show you a pre-operative consultation between vascular surgeon Professor Peter Morris and his patient Mr. Gaylard. The patient has been admitted for an operation to reduce the likelihood of him suffering a stroke. Then you will see the same patient the morning after surgery at the post operative ward round.

Figure 22: Start of Pearl Transcript 4, posted by Rita on 27 November.



Transcript of Video Clip 4

Doctor Patient Communication

- Pre operative visit

1 → (Patient sits on bed in hospital room. Doctor enters room)

2 → Dr: Mr. Gaylard How are you ?

3 → (Doctor sits opposite patient, nearby making eye contact, Patient speaks very

4 → softly.

5 → Dr. speaks louder) (removed authoratively – subjective)

6 → Dr. Nice to see you again. ((Dr smiles and extends hand- patient shakes))

7 → P: Nice to see you sir.(P leans forward almost like a bow, sits with hands folded)

8 → Dr: How have you been since I last saw you ((Dr looks at notes))

9 → P. Well since I last saw you… (Patient has head tilted throughout the

10 → conversation)

Commentary: We are going to show you a pre-operative consultation between vascular surgeon Professor Peter Morris and his patient Mr. Gaylard. The patient has been admitted for an operation to reduce the likelihood of him suffering a stroke. Then you will see the same patient the morning after surgery at the post operative ward round.

Figure 23: Start of Pearl Transcript 8, posted by Ethan on 3 December.

Pearl group members found the availability of colour to frame different authors' voices and thus create clear reading pathways a useful tool, and used it on several occasions in their postings and their transcripts to distinguish between the inputs of different individuals. However, because developing familiarity with such tools was not a learning objective of the course, tutors were not encouraged to promote their use. In the case of posting dialogue this was not necessarily a problem, because tutors engaged in posting dialogue alongside learners and, in so doing, acted as discourse guides, modelling the good practice they had developed through their extensive experience of online group work. Attached dialogue, on the other hand, is an aspect of the development of improvable objects and, in a course context, is likely to form part of assessed work. For this reason, tutors work on the production of these improvable objects only in an advisory capacity and therefore are unable to act as discourse guides and model the use of the tools developed by other groups. DZX999 may be unusual in that project groups were excluded from each other's conferences, but groups of learners work often separately on projects, sharing outcomes but rarely discussing their working processes, so they have limited opportunity to pass on knowledge about useful tools.

In both Jet and Pearl, different understandings of the transcript and of the research project appeared first, and were explored in some detail, in the attached dialogue. Possible explanations were compared, and joint decisions reached. Many of these options and ideas, particularly those relating to format, were never mentioned in the posting dialogue. Nobody felt it necessary to specify that they had moved the margins set by another student, changed someone else's heading or sorted out their spelling or punctuation.

7.6 Development of exploratory dialogue

Attached dialogue supports and promotes the use of exploratory exchanges because detailed challenges can be easily and even accidentally mounted, once mounted they are

automatically retained for consideration, and the imperative for consensus as to the version of the improvable objects on which discussion is focused means that they must be resolved. Attached dialogue also makes use of features of exploratory dialogue that would be less common in speech. The need to relate discussion to specific versions of improvable objects results in repeated use of evaluation, decision-making and compromise. Sometimes these are explicitly mentioned in postings, as in Figure 21 (above) but many, particularly small issues such as point size, spacing and minor corrections are presented in the different versions of the improvable object. The text-based nature of the dialogue supported collation of work and also the direct and detailed comparison of different understandings.

7.6.1 Exploratory dialogue and synchronous communication

Exchanges carried on through improvable objects in these conferences involved exploratory dialogue. In some cases, this was carried into and continued in the postings. More frequently, it prompted a move away from asynchronous dialogue towards synchronous dialogue. This was particularly common when group members needed to make rapid progress on the development of their improvable object. When members of Jet and Pearl groups met synchronously, it was always to discuss progress on an improvable object or to plan how they would develop an improvable object.

Although FirstClass does not preserve a transcript of synchronous discussions, the arrangements for them, and the brief summaries incorporated in the posting dialogue afterwards by participants suggested that learners used them to build joint understanding rapidly on the basis of the different individual understandings presented within the improvable objects. For example, different versions of the Jet transcript inspired Kenny to suggest a synchronous meeting for Jet group:

> In the interests of co-ordinating things and avoiding sub-groups. I would be grateful if someone (Eileen?) could put up a summary of what is happening with the various drafts. I would suggest a live chat tonight to pull things together.

His report on the subsequent synchronous discussion showed that group members were concerned with considering options in a reasoned and equitable way, using attached dialogue to compare possible explanations and to reach decisions.

> Present: Heather, Maggie, myself
>
> 1. We discussed whether there were any options on the project choice, consensus was that we would be going with young women talking as a foregone conclusion.
>
> 2. Eileen and myself had done drafts. One promise from Glenn.
>
> 3. In the absence of the others, and with availability of people within the next 24 hours, thought best way forward was for me to prepare a composite draft between mine/Eileen's. Post it up by 10 am tomorrow morning for any further team comments. Hopefully, Eileen/Kenny can do any fine tuning and put up for final consideration tomorrow evening.
>
> 4. Any ideas from any team members would be very helpful if put on site.

Although the use of exploratory exchanges may extend from attached dialogue and synchronous dialogue into the posting dialogue, this only happened briefly in Pearl and Sapphire groups. The barriers to the use of exploratory dialogue within the postings remained in place, even when the groups had worked together for several weeks. Students did not include direct challenges and contradictory interpretations within postings, although they continued to include them within attachments. They used attachments as they used the constructive syntheses described in Chapter 5, to transfer responsibility for ideas and opinions from the individual and thus avoided mounting personal challenges in the asynchronous environment.

7.7 Transfer of responsibility to group

A shift of responsibility from the individual to the group was achieved in several ways. Students did not treat improvable objects as their individual property; versions were rarely

given their authors' names and they were not signed. The names of documents made direct reference to joint ownership, as in Consolidated-transcript.doc (Pearl's transcript version 10), or to a collective decision, so that version 12 of the Jet transcript became Maybin-type-transcript.doc after group members agreed to follow the transcription conventions used in a published article by Janet Maybin.

While some changes in the text of these documents were signalled in the posted dialogue, the majority were made without comment and, in some cases, the original authors noted that they could not locate the changes that had been made. In working on these documents, students made no use of Word's 'Insert Comment' function, which would have allowed the attribution of amendments to individuals. These improvable objects thus gave learners the freedom to challenge and even completely rework each other's contributions, without individual authors interpreting challenges to their versions as personal attacks.

In addition, improvable objects provided learners with the time to develop challenges, evaluate evidence and consider options. Exploratory talk in a synchronous setting requires learners to do these things quickly, producing immediate responses in a continuous conversation that may last for only a short time. In asynchronous settings, exploratory dialogue is more extensive; members of Jet, Sapphire and Pearl repeatedly referred to setting time aside to read, write and consider attached documents. For example, in Pearl, Charlene posted 'It has taken me 6 hours to compile a table and document that links up, line by line, all of our comments' and Rita reported 'The initial transcript and adding the NVC took me about 6 hours'. In Sapphire, Georgia printed out a document that she promised to 'read in detail this afternoon'. Ryan fitted the work into his free time, backing up an initial response to some documents: 'I've just managed to flip through your two documents over lunch and looks good. I will elaborate late tonight' with a more detailed set of comments at 2am the next morning.

7.8 Development of shared knowledge over time

Message histories and posting content suggest that most conference postings are the product of seconds or minutes. In many cases, they are also opened and discarded quickly; message histories show group members opening large numbers of postings in very short periods of time, and students make reference to the need to skim-read series of messages if they have not logged on to the group conference for a day or more. Postings also have a short lifespan, after which group members are unlikely to return to them. Learners refer back to past postings and forward to expected or promised postings, but such references only extend over periods of hours or days.

When a group moves on to fresh areas of discussion, sets of postings may be moved out of the main conference and into archive areas. For example, in a joint message to two project groups which had recently submitted their project proposal form, tutor Joanna suggested 'Groups Pearl and Jet – would you like me to archive messages prior to project sign-off?' When messages were archived in this way, there were no subsequent references to them. By contrast, although agreed versions of improvable objects were stored in similar folders, conference dialogue made it clear that they were stored for easy access.

The Pearl group conference contained two folders. Postings in which members discussed their proposal form were archived in the 'PPF preparation' folder. The proposal form itself was stored separately in the 'Pearl Group Useful Stuff' folder. The tutors made it clear that any item in the 'Useful Stuff' folder was there 'so's it doesn't get buried in red flags', red flags being markers of unread conference postings. The difference between the two folders related not only to why they were created, but also to how they were used. There was no indication that students or tutors ever returned to the messages archived in the 'PPF Preparation' folder, but they did make use of the 'Useful Stuff' folder for easy access to key documents. A week after Pearl's tutors had stored the group's project proposal form in

the folder, one of them reminded the group: ‘Please make sure that you do the analysis stated in your PPF (it’s in the useful stuff folder). Take another look at it’. Later, when a version of the group’s video-data transcript was lost, one student suggested ‘to save this happening again can we put a copy of the documents in the useful stuff folder?’

Improvable objects, such as the project proposal form and the data transcript, are often the product of many hours of work by learners. As shown above, two members of Pearl referred to spending six hours working on a document before submitting it to the group for consideration. Learners set aside time to download, read, consider and work on these documents, and the message histories show that they returned to them over periods of days, weeks or even months. They had to work with these documents for extended periods and could not easily choose to ignore them as they could ignore postings. This added to the documents’ importance, encouraging learners to devote time to improving them.

Because improvable objects demand time commitment from learners, their text is likely to be denser and to require more thought than that of conference postings. They also require learners to develop a range of skills and knowledge. Each group as a whole had to learn to manage attachments, to post them in forms that were accessible to other group members, to pass control of the document from one to another, and to avoid creating multiple working versions of the same document. In the case of Jet, Sapphire and Pearl, improvable objects were posted using PowerPoint, SPSS, Acrobat and Word software. In each case some learners encountered problems with software use and noted that they had had to learn new things in order to create, read and amend these attached documents.

Some members of Jet group, for example, experienced problems when their project proposal form was returned to them with comments marked using the ‘track changes’. Kenny posted ‘I have downloaded the return PPF, but can’t find any comments.’ Olivia and the tutor both suggested ways of accessing these, but the next day Eileen reported ‘I

am having a problem finding the tutors comments on the returned PPF. I have downloaded the return PPF, but can't find any comments.' Tutor Joanna explained in detail how to access the reviewing toolbar. Even so, the next day, Hannah admitted that 'I can't read them either!' Instructions on how to access the comments had to be added to the 'Useful stuff' folder before everyone in the group could proceed.

As the groups continued to work together, improvable objects eventually became preserved understandings in that they took on a stable form and were no longer available for improvement, although they retained the possibility of future development and the understandings within them remained available for discussion. As improvable objects, they had been a means to an end rather than an end in themselves and so documents such as the project proposal form and the video transcript continued to inspire discussion and support the construction of fresh understandings even after they had taken on a fixed form.

Preserved understandings play an important role in the development of shared understanding because they are used as a means of moving ideas over very long periods of time. Both tutors and students were able to introduce preserved understandings to groups of learners. Section 7.3 showed how video-clips in the CDs provided by the course team presented members of Pearl and Jet with a complex blend of understandings developed at different times by a variety of groups. Learners also introduced well-developed ideas to their colleagues by attaching references or journal articles to their postings.

The use of preserved understandings extends the experience and understandings available to groups of learners. The knowledge artefacts shared in Jet, Pearl and Sapphire included articles and book references that gave group members access not only to the understandings of authors and editors, but also to the ideas on which they had drawn; ideas which could have been developed anywhere in the world and which ranged from up-to-date opinions to the reported discussions of Ancient Greek philosophers.

In a similar way, preserved understandings were employed to move the shared knowledge developed by Jet, Pearl and Sapphire beyond the confines of these groups. The project proposal forms that group members developed together were passed to external assessors, while the presentation documents which they authored jointly were used to share their understandings with the hundreds of other students on the course, some of whom were likely to be engaged on similar projects, or in the study of similar data.

In the months after the course finished, the group conferences were closed and the conference postings ceased to be relevant or accessible. It was the preserved understandings that survived, having been downloaded onto individual computers, shared with others or submitted for assessment. Message histories showed that individuals continued to download these documents even during the weeks after group discussion had ended, when students were working individually on assessed work.

The assessment requirements of the course required elements of these jointly developed documents to be incorporated within later work. The documents authored by the groups thus had a permanence that allowed them to preserve the shared knowledge built together, to carry this over extended periods of time, to present the group's understandings to a wider audience and to make their shared knowledge available for future development.

7.9 Preserving and utilising asynchronous dialogue

This chapter has addressed the question 'How do groups of learners preserve and utilise elements of asynchronous dialogue over weeks or months to develop shared knowledge?' It has demonstrated that they use improvable objects, in the form of attached documents jointly authored by the group, to achieve this. In addition, improvable objects that have taken on fixed form as preserved understandings are used to introduce the ideas of others to the group, and to share the group's understandings with others.

The knowledge that groups of learners make efforts to preserve and pass on in this way is task-based knowledge relating to the cognitive task in which they are engaged. Chapters 5 and 6 showed that, although groups of learners need to develop social and affective knowledge in order to work together effectively, there is no evidence that they seek to preserve such knowledge for future use. Social and affective knowledge supports learners in working together harmoniously on the production of an improvable object, but in the documents they produce together the joint understandings they develop are concerned with their project and their data rather than with group members.

The improvable quality of the jointly authored documents that they attach to their postings sets them apart from other attached documents such as guidelines, references, instructions and journal articles. These latter documents are presented in relatively fixed form as preserved understandings – open to discussion and interpretation by the learners but not to amendment. There is no opportunity to produce or compare different versions; although preserved understandings have the potential to inspire and focus discussion, such documents enter the conference and leave the conference unchanged. Improvable objects, on the other hand, are amended many times by group members.

Improvable objects are different from other attached documents; they are also qualitatively different from postings in that they are developed jointly over days or weeks, are attributed to the group rather than to individuals, continue to inspire and focus discussion over extended periods, and are used to transfer ideas beyond the group. However, the improvable objects examined in this chapter do share similarities with conference postings, as both are textual artefacts. In both, learners use typography and layout to support sense making and the construction of different understandings. In both, they can use these elements to interweave and distinguish different opinions. However, only in the improvable documents are they likely to make overt use of these elements, discussing them and amending them in the light of their discussion. Students in Jet, Pearl and Sapphire not

only made use of colour, font size and related devices to support the joint construction of understanding in their documents; they also explained their use of these to each other.

By definition, improvable objects inspire and focus progressive discourse in which learners work toward common understanding satisfactory to all. Comparing the understandings of their subject matter and of their project expressed by learners when they begin work on a jointly authored document and after they complete that document shows that, in the process, individual understandings are reworked and reshaped. These changes take place during progressive discourse, in which sharing, questioning and revising of opinions leads to new, improved understanding for participants.

Progressive discourse potentially involves the use of cumulative or exploratory dialogue, or a combination of the two. The dialogue carried on both with and through improvable objects in asynchronous learning environments involves key elements of exploratory dialogue, including: assertion, challenge, confirmation, elaboration, repetition, negotiation and critical and constructive engagement with the ideas of others. Because jointly authored documents can be created using different software packages and then attached to postings, learners are able to convey nuances of meaning through a variety of semiotic elements, including: images and timings, as Sapphire group did using PowerPoint; statistics as they did when producing analysis in SPSS files, and tables and characters as Charlene did when she compared Pearl's different analyses in a Word table. These elements would not have been available if they had confined themselves to the use of conferencing software. Different versions of documents, combining the input of a number of authors, encourage direct comparison of different understandings. Because jointly authored documents are usually more extensive than postings, as the transcript word counts in Appendix D demonstrate, they support a detailed and considered consideration of these different understandings. In some cases, groups created versions specifically to support comparison of understandings, setting different viewpoints side by side.

Once different views and understandings have been presented, improvable objects both support and require a move towards agreement. While the software clearly labels conference postings as the property of their author and thus presents them as the views of individuals; improvable objects pass into joint ownership. It is therefore possible to criticise or challenge elements of these documents without implying a challenge to or criticism of individual authors. At the same time, the need to produce a final, agreed version of a document forces learners to find ways of drawing together the different understandings of their subject represented in different versions.

Attachments that function as improvable objects inspire and focus exploratory dialogue and are, in themselves, an integral part of that dialogue. The staccato nature of this discussion can result in students unwittingly mounting substantial challenges to the views of others. Even when this is not the case, the extended periods of time that students devote to these documents have the potential to involve detailed and careful consideration of the views and interpretations of others. Unless learners choose to delete an entire document and start again from scratch, they must necessarily work closely with the ideas of others.

Because of the importance of these improvable objects, it is necessary to consider not only the postings, but also the significant amount of dialogue that takes place through improvable objects in order to understand the dialogue that takes place in asynchronous settings. While discussion carried out through postings is predominantly cumulative, the dialogue that takes place through improvable objects is progressive and exploratory in nature. Through the use of improvable objects and preserved understandings, learners bring the ideas of others into their dialogue, carry significant elements of their discussion forward over periods of weeks or months, develop ideas together in a progressive discourse and preserve their shared knowledge for future consideration.

8 Discussion and conclusion

8.1 Research intention and aims

This study has addressed one central research question: 'How do groups of learners use asynchronous dialogue to build shared knowledge over time?' Its intention has been to increase understanding of the meaning-making tools and skills that can support shared construction of knowledge over time in asynchronous environments. It has therefore had three aims. The first was to identify the distinctive affordances that asynchronous dialogue offers learners, and to investigate the ways in which the advantages and constraints associated with these affordances are affected by their context. The second was to build on previous research by relating asynchronous learning dialogue to earlier studies of the co-construction of knowledge by learners, examining how tools employed to develop ideas over time through this text-based medium could be related to analytic concepts that had been developed to describe the co-construction of knowledge through talk. The third aim was to extend understanding of group learning by exploring both whether and how social modes of thinking together through dialogue, and improvable objects, support knowledge building over time in asynchronous settings.

Chapters 5 to 7 addressed these aims and provided partial answers to the main research question by focusing on three subsidiary questions. Chapter 5 dealt with the short term and considered how groups of learners construct shared knowledge by building links across postings. Chapter 6 examined how groups of learners, working together in asynchronous

environments, negotiate and attempt to avoid unproductive interaction that could limit or prevent the co-construction of knowledge. Chapter 7 took a longer-term view and investigated how learners preserve and utilise elements of asynchronous dialogue over periods of weeks or months in order to develop and share their understandings.

This concluding chapter brings together the results reported in the three analysis chapters in order to address the main research question and thus the aims and intention of the research. It begins by identifying the affordances of asynchronous dialogue, highlighting advantages and constraints of these that are significant for groups of learners and how these are related to context. It goes on to the theoretical contribution of this research: how such groups use asynchronous dialogue to build shared knowledge over time and how this relates to and extends previous research on classroom talk, social modes of thinking and the co-construction of knowledge. It links the outcomes of this research to practice by identifying skills, conditions and aspects of the learning context that can support learners. It goes on to consider methodological issues, including the dependability, transferability, credibility and confirmability of the research. It also identifies the methodological contribution of the thesis, taking a detailed look at how sociocultural discourse analysis, visual analysis and epistolary interviewing can be used to support understanding of online learning and asynchronous dialogue. It concludes by identifying the distinctive contribution of this research and by showing how this work could be extended and built upon in the future.

8.2 Affordances of asynchronous dialogue

As Chapter 2 showed, an extensive body of literature deals with the affordances of asynchronous dialogue – which is discussed under a variety of headings, including computer-mediated communication (CMC), online discussion and written interaction (see,

for example, Goodfellow, Morgan, Lea, & Pettit, 2004; Lapadat, 2002). This literature has focused on three sets of affordances: those of the technology, the medium and the dialogue.

Consideration of the affordances of the technology is often concerned with whether this form of communication is as convenient, place-independent and time-independent as it superficially appears (Harasim, 1990b; Wu & Hiltz, 2004). In the case of affordances of the medium, researchers have considered how the use of different elements, such as transcripts and archives, can benefit learners (Kaye, 1989; Lapadat, 2002). An important concern in relation to affordances of the dialogue has been whether a medium apparently lacking in physical cues and back channels can ever support learning as successfully as face-to-face talk (Chester & Gwynne, 1998; Walther, 1992, 1996; Whitty & Gavin, 2001). Research has also suggested that asynchronous dialogue does not afford the exploratory exchanges that support the effective construction of knowledge in face-to-face environments (Häkkinen & Järvelä, 2006; Littleton & Whitelock, 2005).

The analysis chapters in this thesis have engaged with these continuing debates. This analysis has extended previous work by considering each of these three sets of affordances from the point of view of situated groups of learners. It has also taken into account visual elements of the discussion, and the documents attached to postings, neither of which has been studied in any detail in the past.

8.2.1 Affordances of the technology

Harasim (1990a) identified time-independent communication as an attribute of online education. She pointed to the potential advantages of an environment that is always open, particularly in relation to the development of self-paced and self-directed learning. She also identified potential constraints for groups of learners, relating these to the timing of the dialogue and also to problems associated with silence and decision-making.

By focusing on situated groups of learners, this study has identified another significant constraint of asynchronous interaction. Groups of learners experience time as a constraint in these settings because individual group members have to align their timetables with the often radically different work schedules of others. In face-to-face and synchronous environments, although meetings or classes are fixed, they run for set periods of time that can be slotted in amongst other commitments. In asynchronous groups, the need for members to stay in touch with others cuts across other arrangements. This suits learners who can engage for short but frequent periods of time but is difficult for those who need, or prefer, to concentrate their studies in extended blocks of work. This problem is exacerbated because individual learners often choose to study online if they consider that the times they have available for study are restricted. Time independence is therefore important for them. Students whose study patterns are already limited by factors such as shift patterns, childcare and work schedules find that these constraints are increased when they are required to work together to meet deadlines.

The study patterns of asynchronous learners cannot be understood without reference to their offline, as well as their online, engagement. Online interaction is interspersed with substantial periods of offline work. During these periods learners may be at their computer attending to online group interaction but, in many cases, this proves impracticable or distracting. Individual learners have different patterns of engagement in asynchronous groups and these patterns involve online learning activity, offline learning activity and a variety of unrelated activities. Because of this, asynchronous dialogue proceeds slowly, with each turn in the conversation taking hours or days to reach every group member.

This research has also shown that there are different forms of asynchronous dialogue, and that these have different temporal contexts. Analysis of asynchronous communication in previous studies has focused on the ‘posting dialogue’. Individual conference postings function as turns in this dialogue. These turns are usually fairly short, consisting of a few

words, lines or paragraphs. The content and timing of these turns suggests that many are produced quickly, and that little time is spent is revising them. By contrast, turns in the 'attached dialogue' identified here consist of documents that are attached to postings. Not all such documents function in such a way – only those that are authored by their sender and form part of an extended exchange.

Attached dialogue proceeds at a slower pace than posting dialogue and those who engage in it are more able to make use of the time-independence offered by asynchronous communication. Learners may set aside substantial periods to consider or develop their next turn in the dialogue. They thus have time to consider previous input and to compare and evaluate the contributions of other group members before responding. They also have opportunities to consult reference materials or to ask for information.

The slow pace of asynchronous dialogue has been apparent to users and researchers for many years. Harasim (1990a) drew attention to how the speed of the interaction constrained decision-making, and her account aligns with the finding reported in Chapter 5 that the slow pace of discussion means that decision-making within groups of learners becomes a delicate object that must be negotiated carefully within the dialogue. Analysis of asynchronous group dialogue over different time scales produced an additional finding. The pace of this dialogue and its association with offline study patterns result in learners being concerned to ensure that their dialogue proceeds steadily, with no sudden surprises that could invalidate previously completed offline work. At the same time, they need to work to avoid the time-consuming elements of interpersonal conflict.

In order to avoid unproductive interaction and to negotiate delicate objects, the current study demonstrated that learners make use of their opportunities to think before participating. As Chapter 6 showed, there was no need to respond at any point with a hasty, ill-considered reply. The slow pace of the dialogue offered learners opportunities to spend

time developing and maintaining a supportive social context for group work. They had time to phrase their contributions carefully, adding both compliments and courteous phrases (Lapadat, 2007). At the same time, the words of others were quoted and echoed, and supporting links were firmly established.

8.2.2 Affordances of the medium

This was possible not only because there was time available to do these things, but also because the FirstClass medium typically preserved all their conference messages, thus providing an accessible record of past dialogue (Kaye, 1989). Unlike face-to-face learners, whose speech is ephemeral; asynchronous groups of learners do not need to search for methods of preserving their interaction. What they do require are ways of prioritising archived contributions and of making these available for fast and easy retrieval in the future. Additionally, in the absence of many of the devices that link turns of speech to form coherent dialogue, they need to be able to distinguish the contributions of individuals and to link streams of postings to develop coherent discussion. The analysis in Chapter 5 showed that, in order to make use of the tools available for these purposes, learners need to be aware of their availability and benefit when their use is modelled by tutors acting as discourse guides (Littleton & Whitelock, 2004).

Both task-focused dialogue and social dialogue in asynchronous learning environments involve the use of layout and of typographical elements afforded by the medium. In the case of FirstClass, these include font, colour and point size. However, although such elements have been studied in the past, (Donath, 1999; Garrison & Anderson, 2003; Parks & Floyd, 1996; Walther & D'Addario, 2001), their implications for online learners have not previously been considered.

This study has shown that these are crucial elements of text-based dialogue, codes that help to transform it from a set of keystrokes into a series of complex and meaningful

interactions. Visual elements afforded by the software (Jewitt & Oyama, 2001; Kress & van Leeuwen, 1990, 2006) help learners to structure discussion so that postings build on past turns and structure future contributions, making the ongoing dialogue comprehensible to participants. Layout and typography are also used to create reading pathways through postings, to combine and distinguish the input of several learners and to give greater or lesser weight to different ideas and responses. In so doing, they function as important back channels to the dialogue (Drummond & Hopper, 1993), wordlessly signalling reaction to the contributions of others. The analysis in Chapter 7 suggested that learners find it difficult to make use of these affordances unless their use is modelled by a tutor or a more experienced student acting as a discourse guide (Littleton & Whitelock, 2004)

8.2.3 Affordances of the dialogue

Discourse guides can help learners to become aware of the affordances of asynchronous dialogue that facilitate the construction of meaning (Lapadat, 2000, 2002, 2007). In order to make use of these affordances, learners need to be aware of how their contributions can be connected to build coherent dialogue. Herring (1999, 2003) demonstrated that coherence cannot be established in asynchronous dialogue in the same way as in face-to-face speech, because temporal adjacency cannot be used to establish links, and because the norm in spoken talk of 'no gap, no overlap' cannot be maintained. Lapadat (2007) built on this research and identified some of the ways in which coherent dialogue can be built online by asynchronous groups.

Chapters 5 and 6 extended this work, showing how coherence is established in asynchronous educational settings, and how this is related to both task-based talk and to social interaction. The cohesive ties that bind together spoken and written exchanges (Halliday & Hasan, 1976) were shown to be important in building and structuring online learning dialogue, as they are in the construction of offline dialogue (Mercer, 2000).

However, the timing cues of face-to-face speech were found to be less effective, and even misleading, in an asynchronous setting.

In speech, the three-part list (Jefferson, 1990) signals to listeners that a conversational turn will be complete once the third element has been supplied. Chapter 5 showed that three-part lists are used in postings but, although they form part of discursive patterns, they do not have the same timing function. In addition, the option of producing bulleted or numbered lists allows them to be extended beyond three points without creating confusion.

Another linking device in face-to-face dialogue is the adjacency pair (Sacks, et al., 1974). The first part of such a pair prompts a conversational partner to supply the second half, so a question prompts an answer and a greeting prompts an acknowledgment. If the expected response is not quickly supplied, this is a sign of trouble in the dialogue. Chapters 5 and 6 showed that offline experience of the adjacency pair proves misleading online, and that learners mistakenly interpret a lack of response as a sign of trouble in the dialogue.

One consequence of this in online learning groups is that learners who receive no response to social overtures can take this as a sign of trouble. They therefore assume that social talk is inappropriate in an educational setting and do not engage in it. Without engaging in this type of dialogue and thus constructing social knowledge, groups find it difficult to carry out key organisational tasks such as scheduling work and assigning responsibility. A lack of social knowledge also limits individuals' ability to judge the reliability and evaluate the input of their fellow learners. Their social requirements of the dialogue are not only confined to a search for social cues and back channels of communication – learners require a replacement for the informal social chat that takes place on the margins of face-to-face groups as members arrive, depart or take breaks together (Kreijns, et al., 2003; 2004).

The affordances of asynchronous communication thus present groups of learners with constraints and advantages relating to the technology, the medium and the dialogue.

Chapters 5, 6 and 7 all demonstrated that a central concern for learners who communicate in this way is to proceed steadily without wasting time due to unexpected decisions or unproductive interaction. As a result, their methods of co-constructing knowledge, both in the short term and over extended periods, involve numerous strategies for shifting responsibility from the individual learner to the group. These strategies have not been apparent in previous studies of asynchronous discussion in which researchers' attention was primarily focused on individual learners (Hara, et al., 2000; Kanuka & Anderson, 1998; Rourke, Anderson, Garrison, & Archer, 2001).

8.3 Theoretical contributions of this research

8.3.1 The contexts of asynchronous dialogue

This research has demonstrated that, for learners engaged in asynchronous dialogue, context is more than a single entity. It is not the case that each participant is in a different social and physical setting, but that they develop and share a common context in their online environment. They have limited ability to see the same things, for even the messages they share are likely to be ordered differently by each learner and will appear differently depending on screen size and configuration. Section 5.2 showed that unless individuals are online at the same time as other participants, they will not receive messages at the same time as they are sent and, even if they are online at the same time, they may be engaging with different threaded conversations rather than communicating with each other. Given this lack of shared context, it is important to be aware of the multiple contexts of asynchronous dialogue and to examine how these can be used to resource, rather than to constrain, the construction of common knowledge.

8.3.2 Short-term co-construction of knowledge

In the short term, groups of learners are concerned with carrying and developing ideas through sequences of postings. In an online conference, such sequences typically support the co-construction of knowledge over intervals of minutes, hours or days. The main challenges for learners are to establish which postings relate to each other and how they do this, to identify and prioritise elements to be taken forward and developed, and to organise their dialogue so that it proceeds smoothly and steadily.

Section 5.3 showed how, to establish links within and between postings, learners make use of cohesive ties (Halliday & Hasan, 1976). These grammatical elements are used to connect stretches of language by building links between smaller units such as words, phrases and sentences. In asynchronous environments, such references are used to establish and mark adjacency between postings (Lapadat, 2007). This is important in these settings, as conversational turns are often produced in blocks, with individual learners logging on separately and contributing to or beginning several discussions at a time. This results in different topics being discussed in parallel, rather than in sequence (Herring, 1999). In many cases, postings are linked to the ongoing dialogue by the use of threading, or by cohesive ties that relate the titles of several separate postings to each other. Ideas may also be linked by direct quotation of previous postings.

A textual medium provides opportunities for the use of cohesive ties that are not available when using speech. Series of ideas may be numbered, bulleted or separated typographically in a variety of ways. Although numbering may be used in speech, numbering that extends further than three or four points becomes confusing and even comic. In asynchronous dialogue, such divisions act as cataphoric links, prompting others to consider these ideas individually rather than as a set, and to provide responses to each in turn. These links therefore promote an orderly, structured response.

Section 6.7 showed that the use of cohesive ties serves not only to link contributions, but also to build groups by establishing shared knowledge and shared experience. Individual groups quickly begin to develop their own vocabulary. Nicknames for the group, for documents or for specific data sources are carried from one threaded discussion to another. As online groups have only limited opportunities to get to know each other and to establish connections, these ties are important to their co-construction of social knowledge.

Cohesive ties link and structure dialogue in face-to-face learning environments but their role is doubly important in asynchronous environments, where learners cannot rely on temporal proximity to establish links between conversational turns. Other devices identified in synchronous settings – such as recap and repetition (Mercer, 1995, 2000) – have less relevance online because they are techniques designed to preserve the otherwise transient medium of speech (Wells, 1999) and there is therefore little need for them in a textual environment. Instead, online groups employ new patterns of dialogue that allow them to deal with the challenges of their environment.

There have been few previous examinations of the construction of shared knowledge through asynchronous dialogue. Herring (1999, 2005) has focused on the linguistic structure of computer-mediated communication, and on the construction of interactional coherence within it. Lapadat (2007) examined methods of increasing coherence and negotiating agreement in online university courses but the groups she studied were not required to reach consensus and were therefore able to engage in 'extended arguments' without a need to move speedily to resolution. The research reported here has therefore made a significant contribution to knowledge by identifying three discursive devices employed by asynchronous groups of learners to build knowledge together: constructive synthesis, the proposal pattern and powerful synthesis. Because these three devices help to shift responsibility for decisions away from individual learners, groups have the

opportunity to construct knowledge together without engaging in time-consuming interpersonal conflict.

8.3.3 Constructive synthesis

Constructive synthesis was described for the first time in Section 5.6. This is a discursive device that enables groups to establish what they already know and what they have agreed. It is a knowledge-building tool, used to unite ideas and information from two or more past postings. Its author selects and combines elements from previous turns in the dialogue and moves the dialogue forward by presenting this synthesis to the group. The technique promotes consensus, presenting new understanding as uncontroversial common knowledge and omitting any reference to the selection that is necessary to produce the synthesis.

Two examples of constructive synthesis were provided in Figure 2 (page 165). In the first case, 'timing difficulties' was used to summarise comments relating to the timing of a live chat that had been made in several previous postings. This two-word summary of the discussion established that scheduling the chat was problematic. This had not previously been clearly the case – most of the group had agreed on a time. Nevertheless, the constructive synthesis presented this as an unproblematic reference to shared knowledge and, as such, it was not disputed, but was acted upon. A second example of constructive synthesis in the same posting moved the group towards a choice of data for their proposed project by eliminating five of the seven options. Once again, this summary prioritised some previous contributions and overlooked others. Linking elements from the past in this way changed their status from subjective opinion to shared knowledge and the five pieces of data omitted from the constructive synthesis were not mentioned again even by learners who had previously argued for their selection.

Constructive synthesis is an individual contribution to a group's knowledge building. It forms part of the proposal pattern, a group accomplishment that allows learners to discuss

and develop these summaries as a basis for future activity. Like constructive synthesis, the proposal pattern is tailored to the requirements of asynchronous groups of learners: it allows individuals to participate over periods of hours or days, it moves discussion steadily forward, and it avoids direct personal challenges. At the same time, it allows decisions to be positioned in relation to past group choices rather than to individual proposals.

8.3.4 Proposal pattern

The proposal pattern, first described in Section 5.7, begins with a proposal by an individual. This is often in the form of a three-part list, so there is no suggestion that a decision has already been made. This impression is strengthened by an immediate request for responses. Such proposals are not always taken up; they may provoke no response. When the pattern is completed successfully, the proposal is quoted, commented on and developed by other group members. A constructive synthesis is produced, retaining some elements of the discussion and abandoning others. This may then be used as the basis for a fresh proposal.

Section 5.7 follows a proposal pattern from its start as a three-part list outlining ideas for a group's future work, accompanied by a request for comments. These proposals are taken up and discussed in a subsequent posting, the discussion is then condensed into a constructive synthesis, and this is used to begin a subsequent proposal pattern which again takes the part of a three-part list, accompanied by a request for comments. Other proposal patterns are highlighted in the images of Sapphire Group data presented in Appendix G.

In the proposal pattern, knowledge is co-constructed little by little. There is no need for members of the group to be online at the same time, or to vote in order to achieve consensus because contributions build on each other and the process is extended rather than immediate.

8.3.5 Powerful synthesis

When the proposal pattern breaks down and groups have to make a decision quickly, they have few options. They could meet synchronously or they could appoint a leader to make the decision for them. Neither of these alternatives is easy to adopt at short notice. Instead, Section 5.8 described for the first time the technique of powerful synthesis, a group's use of the words of a tutor to move them forward. Like constructive synthesis, powerful synthesis unites and thus adds weight to ideas from previous postings. However, it is accepted as a basis for future action not because the group has considered and adopted it, but because it suits the needs of the group at that point to accept their tutor's viewpoint. This is not an instruction by the tutor; it is the group making use of their tutor's words and the assumed authority of the tutor in order both to keep the dialogue proceeding steadily and to avoid time-consuming interpersonal conflict.

Powerful synthesis is less common than constructive synthesis or the proposal pattern because it is only necessary when a group must choose quickly between two conflicting viewpoints. According to the interview and conference data analysed for this research, groups typically try to maintain consensus and so points of conflict are rare. Section 5.8 shows an example of powerful synthesis, locating it within a thread and showing why it was necessary and how it was used. A second example is highlighted in the images of posting text presented in Appendix G. The images show how group discussion developed within Sapphire Group, how opinions diverged, and how powerful synthesis was mobilised to avoid confusion or conflict.

8.3.6 Cumulative dialogue

A potential problem with the concern of asynchronous groups of learners to avoid unproductive interaction is that they may thus miss the benefits of socio-cognitive conflict, in which ideas are counterposed, challenged, defended or defeated (Golay Schilter, et al.,

1999; Hinde, et al., 1985b). Previous study of the dialogue in online conferences suggested that this might be the case and that students do not engage in the exploratory exchanges or higher-order thinking that can be observed in face-to-face settings. Instead, they engage in an online version of the cumulative dialogue used to build knowledge together in the classroom (Mercer & Littleton, 2007).

There are many positive aspects to the extensive use of cumulative dialogue, in which exchanges are characterised by repetition, elaboration and confirmation. This is a well-established method of building knowledge together successfully (Rojas-Drummond, Mazon, Vega, & Velez, 2007). Cumulative dialogue allows groups of learners to pool their experience and build positively on previous turns in the discussion, constructing shared knowledge by a process of accumulation.

Another positive aspect of asynchronous discussion is that online learners' need to avoid interpersonal conflict means that the characteristic elements of disputational dialogue that can be observed in classrooms are almost entirely absent. Asynchronous groups of learners do not often engage in short exchanges of assertions and counter-assertions or in the more extreme elements of disputational talk such as insults and threats. Disputational dialogue is therefore rarely observed in such contexts.

However, exploratory dialogue is the social form of thinking that is 'essential for successful participation in "educated" communities of discourse' (Littleton & Whitelock, 2005, p152). Exploratory dialogue involves making reasons and explanations explicit where necessary, with all participants contributing critical evaluations in order to reach joint conclusions. It is an important element of the progressive discourse that enables learners to develop a shared understanding, because progressive discourse requires evidence to be brought to bear on propositions and all beliefs to be subject to criticism if

necessary. Online learning environments would therefore be impoverished if they did not support the use of exploratory dialogue.

Few previous studies have investigated the social modes of thinking in which online learners engage. Those that have done so have found them to be predominantly cumulative in nature (Littleton & Whitelock, 2005; Wegerif, 1998). However, asynchronous dialogue is not monolithic – even in a conference setting it has many forms. Some of these forms only appear occasionally, for example the exchange of personal messages by individuals within the group, or the posting of reports on synchronous meetings for reference and for the benefit of non-participants. Some forms of asynchronous dialogue, such as email and text exchanges, are hidden from the majority of the group because they take place outside the conference environment.

An original contribution of this research has been to distinguish between posting dialogue and attached dialogue (Section 7.4). For learners working together online on a group project, conference postings are likely to represent only a small percentage of their exchanges. The majority of their interaction does not take place through the posting dialogue visible when a conference is opened, in which learners participate through reading and writing messages. The attached dialogue, carried out through the medium of documents appended to postings, can make up the bulk of conference exchanges in terms of word count and time spent.

Posting dialogue and attached dialogue are similar in that they are textual, asynchronous and involve the same participants. The two forms of dialogue differ in the time allocated to them, the status given to them, their authorship and their cumulative or exploratory character. It is through attached dialogue that knowledge is co-constructed over extended periods of time, and it is through the improvable objects developed in this way that ideas and contributions are passed beyond single groups.

8.3.7 Co-construction of knowledge over extended periods

Attached dialogue takes place within the documents appended to conference postings. These documents can differ considerably in size and content and they include text, images, statistics, presentations and other semiotic forms. From a knowledge-building perspective, two types of attachment are significant: preserved understandings and improvable objects.

Preserved understandings carry shared understandings over time into new contexts where they can be reinterpreted and reworked. They are resources that support knowledge construction but that are, for a period, unavailable for reworking and change. A journal article attached to a posting, for example, is available as a resource that presents the understandings of its authors to its readers, without them being expected to make permanent modifications to its text. Preserved understandings can carry ideas across great distances and long time periods, and serve as a method of binding the knowledge co-constructed by small groups into a wider human endeavour that extends across space and time. For asynchronous learners, preserved understandings are a means of bringing the work of others to the attention of the group.

Similar representations of understanding have, of course, been described in the past. Varelas and Pappas (2006), for example, referred to books by the broad term, 'semiotic tools'. Lecture notes were categorised by Crook (2002) as collaborative resources but, again, this was a broad description. Latour's (1986) reference to two-dimensional artefacts such as texts and diagrams as inscriptions, was more specific, but he stressed that these inscriptions were immutable.

The term 'preserved understandings' is used here to indicate artefacts that have been mutable in the past and may be mutable in the future but currently exist in a form that is, and may remain, fixed. As such, they can be distinguished from improvable objects

although the two do not differ in size, shape or form. The distinction between preserved understandings and improvable objects is their availability for change and development.

Improvable objects are knowledge artefacts that participants work collaboratively to improve because they are a means of solving real problems collectively (Wells, 1999). They act as a focus for the application of information and experience, and they inspire a progressive knowledge-building discourse in which participants work to develop a common understanding satisfactory to all. An improvable object not only provides the focus for progressive discourse, it also embodies the progress made within that discourse. Improvable objects are a means of sharing and building ideas over time, making them sites for the display, comparison and group development of different understandings.

Preserved understandings have not been described as such before, but improvable objects were first described in the context of knowledge building, as a way of understanding how groups develop a shared understanding through progressive discourse. Although the word 'object' implies physicality, Bereiter and Scardamalia (1996) give theorems, explanations and justifications as examples. Nevertheless, Wells' (1999) description implicitly connects them with a face-to-face setting by describing them as a method of overcoming the constraints of talk by preserving the understandings produced and by allowing the systematic pursuit of a line of reasoning in order that progress can be seen to be made.

If these were the chief advantages of improvable objects, they would have little value in an asynchronous setting because its textual nature provides facilities for meeting these objectives. However, improvable objects have other attributes. They provide time, space and opportunity for knowledge development, and they function as sites for the extensive consideration of questions and propositions.

This study has shown that a significant advantage they offer asynchronous groups of learners is that they support the shift of authorship from individuals to the group and thus

provide both the means and the opportunity for learners to engage in progressive discourse (Section 7.7). In addition, they support the use of exploratory dialogue that has affordances not available in face-to-face situations, in that it can be far more nuanced, detailed and extended than synchronous talk (Section 7.9).

Chapter 7 showed that it is within improvable objects that attached dialogue takes place, with different versions of these objects functioning as turns within the dialogue as well as providing representations of the current state of group understanding. Improvable objects prompt learners to engage in exploratory dialogue because they support engagement in more extensive comparison and development of questions and propositions than would be possible either in speech or in the relatively short textual form that is the conference posting. Within an online conference, learners consider posting dialogue and attached dialogue at different times. There is little evidence that they set time aside to consider individual turns in the posting dialogue or spend much time on composing their own turns, but they often do so with attached dialogue, which allows time, space and opportunity for detailed work on input. Unlike the spontaneous exchanges that are common in classroom talk and conference postings, learners may spend many hours with improvable objects, working to develop understanding.

Time for reflection is important, but it alone is not sufficient to prompt a move from cumulative to exploratory dialogue (Littleton & Whitelock, 2005; Wegerif, 1998). Learners are still constrained by their timetable, and they are still likely to lack the social knowledge that could allow them safely to critique an individual's ideas without implicitly criticising that individual. Improvable objects support a move towards exploratory dialogue because, like the constructive synthesis and proposal pattern described above, they can be utilised by individuals to transfer responsibility to the group.

Although learners may begin by producing different versions of a document, each attributable to an identifiable author, these are soon combined and their ideas worked together to represent group understanding (Chapter 7). Improvable objects lose their individual authorship, and may be substantially amended by any group member without provoking interpersonal conflict. Unless vectors drawing attention to amendments are included (Kress & van Leeuwen, 1990), such amendments are often difficult to discern.

When asynchronous learners are simultaneously engaged in the development of an improvable object, it becomes difficult for them to avoid engaging in exploratory dialogue. Everyone in a group may work on the latest version at the same time, and therefore variant responses are produced. When these variant versions are presented to the group, the dialogue could fork, with different representations being developed in parallel. To avoid this, when a group is presented with different ideas, propositions and understandings in different documents, these must be considered, challenged and justified in order that the group can agree on a single representation of their shared understanding.

Exploratory dialogue is the default position in such situations (Section 7.4), because learners would have to work to avoid engaging in it. Not only do improvable objects prompt engagement in exploratory dialogue, they also allows a wider range of expression than is possible in conference postings because they can be created in a range of software applications and may include images, animations, text, presentations or statistical charts. The layout and typographic facilities available in posting dialogue are extended here, so that within the attached dialogue the views of different people can be framed and weighted through use of columns, numbering, colour, graphics and many other devices (Kress & van Leeuwen, 1990, 2006). This use of typographic features allows the characteristic elements of exploratory dialogue – active participation, justifications, alternative views, visible reasoning and the joint consideration of opinions, challenges, statements and suggestions –

to be interwoven in one turn in the attached dialogue and used to inform future versions of the improvable object, as is demonstrated in Appendix F.

A further advantage of these improvable objects for the development of knowledge over extended periods of time is that they do not only form turns in the attached dialogue, they are also artefacts that can be labelled and filed for future access (Section 7.1). Learners can, and do, return to them many times over periods of weeks and months. They preserve in usable form different stages of the dialogue, making it possible to loop back and return to ideas after long periods if these ideas are judged to be relevant.

8.3.8 Co-construction of knowledge

This thesis has provided evidence that groups of learners use asynchronous dialogue to build shared knowledge over time in different ways, depending on the time period involved (Chapters 5-7). Over short periods of time, from word to word and from posting to posting, they build shared vocabulary, history and understanding through the use of cohesive ties that not only refer back to previous dialogue but also serve to structure future dialogue.

In the slightly longer term, over series of postings, they build knowledge slowly and steadily through the use of devices such as constructive synthesis, the proposal pattern and powerful synthesis. They accumulate and build on ideas in a cumulative dialogue that takes place through the medium of conference postings.

On a more extended scale, over periods of weeks or months, they are able to engage in attached dialogue, mediated by improvable objects. The development of these improvable objects involves exploratory dialogue. This online discussion has affordances not available in speech, and can be far more detailed than face-to-face talk. Over extended periods of time, groups of learners are able to locate their asynchronous dialogue within continuing wider discourses by the use of preserved understandings.

This research showed that some analytical constructs developed for the understanding of learning in face-to-settings can be employed to understand how the co-construction of knowledge takes place online. Cohesive ties are used both online and offline (Chapter 5) but other linking elements identified in face-to-face conversation are not employed in the same ways online (Halliday & Hasan, 1976; Jefferson, 1990; Mercer, 2000). Cumulative and exploratory talk were first identified in face-to-face contexts, and this thesis has demonstrated (Chapters 5 and 7) that these concepts provide a way of understanding the cumulative and exploratory dialogue that takes place online (Kleine Staarman & Mercer, 2007; Mercer, 2000, 2002; Mercer & Littleton, 2007; Mercer & Wegerif, 1999). It has also demonstrated that an understanding of improvable objects can be mobilised in the study of an asynchronous context (Chapter 7) to support understanding of the co-construction of knowledge over extended periods of time (Wells, 1999).

The next section moves on from the theoretical aspects of the co-construction of knowledge in order to examine the practical implications of this research.

8.4 Contribution to practice

The study has shown that online learners need to develop skills that will allow them to work together as a group, and to employ asynchronous dialogue effectively. Like other study skills, these skills could be taught in separate courses, but it is also important that the pedagogy of any online course reflects these needs and recognises that learners need to construct social knowledge and tool-based knowledge alongside task-based knowledge. Students require time to develop social understanding and to become familiar with the medium they are employing. They need guidance to do this, both directly from their tutors and indirectly in terms of expected learning outcomes and assessment priorities.

At present, it cannot be assumed that students will begin an online course with sufficient social and online communication skills to engage in the effective co-construction of

knowledge. An important role of the tutor is therefore as a discourse guide (Littleton & Whitelock, 2004) who, by modelling skills and behaviours, can help students to develop appropriate ways of talking, writing and thinking in an asynchronous group environment. Wertsch speculates that the skills called for by online environments will 'have a major impact on how we define success, intelligence, and other aspects of human functioning in the years ahead' (Wertsch, 2003, p903). If such skills are not identified, modelled, or explicitly taught, learners will find it difficult to make effective use of them.

In a face-to-face setting, social knowledge about the group and its context is developed largely without the help of tutors. Relationships can be based on prior knowledge or on the identification of shared experience. Online, learners need both the opportunities and the time to engage in informal social talk (Kreijns, et al., 2003; 2004). Such talk allows them both to understand the context within which they are working and to timetable their work effectively. It also helps them to judge the reliability and knowledge of fellow learners, to evaluate their own work and that of their colleagues, and to make sense of the contributions of others. The construction of social knowledge can be supported by group introductions and informal social exchanges, the development of shared vocabulary and history, and the use of polite forms of address and mirroring.

Current pedagogies mark the construction of task-based knowledge as valuable in a variety of ways. It is promoted by tutors, listed among the learning outcomes of courses, and assessed both formatively and summatively. Representations of task-based knowledge are valued, stored and passed on in the form of improvable objects and preserved understanding. Students' experience of formal education thus produces an expectation that task-focused discussion is the appropriate focus of educational dialogue. However, despite this stress on task-based dialogue, formal education is also structured in ways that make the co-construction of social knowledge almost unavoidable. Coffee bars, refectories and playgrounds are not only provided for learners, their use is scheduled, promoted and

sometimes enforced. Unless the construction of social knowledge in online educational settings is similarly required, scheduled and valued, and its importance made clear to both tutors and learners, there is little incentive for learners to spend time developing it. They therefore lack the important emotional dimension of collaborative learning (Crook, 2000)

Without social knowledge, Chapter 6 showed that online learners struggle to interpret the silences within their dialogue. Asynchronous dialogue is necessarily framed by long periods of silence and, each time individuals re-enter the dialogue after a period of silence, they face the challenge of bridging the gap by linking their contribution to what has gone before or to what is expected to follow (Azmitia, 2000). To do this effectively, learners need to be able to employ discursive devices such as cohesive ties, constructive synthesis and the proposal pattern. They also need to have enough information about their context to interpret uses of silence as a back channel within their dialogue and as a source of information about group members. In both cases, silence can prove misleading unless social knowledge can be used to make sense of it.

Online learners expect adjacency pairs to be completed just as they would be offline (Section 6.4). If a question receives no answer or a proposal receives no response, the ensuing silence may be interpreted as a back-channel communication that something is wrong or that an individual's input is not valued. This may be the case; interview data showed that learners use withdrawal as a strategy to mark disagreement or disinterest. Equally, there may be no response because other students are working, or on holiday. More positively, the proposal may have been so rich in ideas that others are taking time to consider it, or do not feel qualified to respond. Silences in dialogue can have very different explanations that learners need to be able to interpret (Azmitia, 2000). In order to do this, they need to develop knowledge about their group that will allow them to understand the context in which they are working (Crook, 2000). They also need to develop their online learning skills, so that they are not reliant on silence as a back channel but are more able to

employ alternatives such as emoticons, abbreviations and brief acknowledgements as well as resources such as message histories, profiles and calendars.

These skills and knowledge support the development of group understanding; they also support group engagement and help to avoid interpersonal conflict. Long-term silences are associated with a number of unproductive roles such as the freeloader, the lurker and the social loafer (JonKatz, 1998; Karau & Williams, 1993; Mitchell, 2007) and support a series of negative assumptions about fellow learners (Section 6.2). This research has identified another unproductive role, that played by the 'phantom student' who has withdrawn from the course without informing fellow group members (Section 6.9).

Without sufficient social knowledge about their group, learners may unfairly assign these roles to hard-working group members because they are unable to make accurate judgements about the reliability and workload of their colleagues. Misjudgements about these factors limit learners' ability to schedule work both individually and as a group, and may be compounded by a failure to provide frequent progress reports or to share and make use of individual timetables. Developing shared work practices is an important skill for asynchronous learners, which supports the co-construction of knowledge and also links individual learners into a group.

Another method of linking individuals into a group is for them to own work jointly, rather than creating and developing individual elements within a group project (Dillenbourg, 1999; Panitz, 1996). Methods of transferring responsibility from the individual to the group therefore have an important social function, as well as allowing learners to engage in cumulative and exploratory dialogue rather than non-productive, disputational dialogue. It is difficult for tutors to act as discourse guides and model methods of doing this, because they are not directly involved in the production of assessed work (Littleton & Whitelock, 2004). However, if tutors have a repertoire of techniques for transferring responsibility

from the individual to the group, these can be proposed, explained and clarified at appropriate points. In these ways, students can be encouraged to situate their work within the ongoing dialogue, and to pass control of it to the group.

Short-term techniques for achieving this transfer include those identified by this research: constructive synthesis, the proposal pattern and powerful synthesis (Chapter 5). In addition, this research has shown that politeness and mirroring can be used to stress connections, as can the creation of threads of discussion (Chapter 6). The effective use of layout and typography to distinguish, prioritise, interweave and link individual contributions is important for the development of group discussions, and also for the creation of rich sequences of exploratory dialogue (Chapter 7).

Learners can be introduced to the use of the structuring principles which allow viewers to decode layout – salience, perspective, balance, frames, vectors and reading paths – and to develop and structure their discussion (Kress & van Leeuwen, 1990, 2006). These visual elements of text-based dialogue also provide useful back channels of communication, allowing learners to react without or alongside verbal comment to the contributions of others (Goffman, 1981; Gumperz, 2001).

Such back channels are more useful and less open to misinterpretation if learners are aware of their existence and are clear that where and when elements appear in a text marks them as more or less important, that contributions can be given extra weight by use of typography and layout, and that they can be marked off from each other if they are framed by spaces, lines, pauses or other elements (Chapter 5). Once again, these techniques can be introduced and modelled by tutors acting as discourse guides (Littleton & Whitelock, 2004), providing learners with methods of creating clear reading pathways through complicated discussions.

The skilful use of these techniques is also important within the attached dialogue that takes place through improvable objects. Here tutors have little opportunity for modelling, so both formative assessment and instruction are important. Improvable objects offer learners a range of tools not directly available within their conferencing software, but the use of these tools does not support the co-construction of knowledge if other group members cannot make sense of what is being communicated. If students are unaware of tracked changes created in word-processing software, or of the audio channel embedded within presentation software, then they are excluded from or unaware of parts of the group dialogue. Again, social knowledge is important because it can provide both learners and tutors with the confidence to express confusion and to ask for help.

Improvable objects have an important role to play within online group learning because they allow a wider range of expression than is possible through postings alone and because they support dialogue that includes extensive and detailed comparison of questions and propositions (Chapter 7). However, the absence of references to attached documents in the literature related to asynchronous dialogue suggests that their importance has previously gone unnoticed. The awareness that this research has produced of the affordances offered by attached documents is significant because it means that they can be incorporated more effectively within courses. Online learners can be supported to use them to present, develop and preserve understandings. Even when attached documents are not used as improvable objects, they are a means of carrying ideas forward and making them accessible to students, who have to find methods of negotiating their way through the hundreds of postings that make up conference dialogue.

This research has also demonstrated (Section 7.8) that improvable objects allow learners to regain an important element of online study: time independence. Online learning is commonly assumed to allow students freedom to choose when they work, but this freedom is lost if online groups need to align their personal schedules in order to communicate

regularly. Because improvable objects are developed over longer periods of time than posting threads, work on them can be scheduled at the convenience of individuals.

Learners and tutors should also be aware that improvable objects function as turns in attached dialogue, a form of asynchronous dialogue that runs alongside the more immediately apparent dialogue carried on through conference postings. Attached dialogue is an important vehicle for the development of ideas; it offers a wide range of modes of expression, prompts individuals to frame input for group consideration, and supports the co-construction of knowledge. This form of dialogue is a site for the display, comparison and development of different understanding; it supports the application of both information and experience and provokes exploratory exchanges between learners.

This section has shown that, in order to make effective use of the affordances of asynchronous dialogue, the pedagogy of online courses should support and promote the co-construction of social knowledge and skills-based knowledge alongside task-based knowledge. The following section considers whether these findings are dependable, transferable, credible and confirmable and, if so, how this research contributes to the practice of educational researchers.

8.5 Evaluation of the methodology

8.5.1 Data gathering

The primary data sources for this study were three asynchronous conferences. In addition to the conference postings on which previous research had focused, this data set also included attached documents, message histories, archive folders, icons and menus. This extended data collection was important because it showed that the majority of activity does not necessarily take place in conference postings, and also revealed that attached documents are an inextricable part of conference dialogue. Following groups from their

formation made it possible to locate dialogue as part of a historically situated encounter and thus to chart the time dimension of asynchronous learning. Analysis was therefore sensitive to the phases of the project, and could focus on a series of different time periods.

When evaluating the methodology of quantitative studies, it is appropriate to ask whether they are reliable, valid and generalisable. These qualities cannot easily be transferred to qualitative settings, where traditional indicators such as statistical sampling are not available and where interpretations have a subjective element (Creswell & Miller, 2000; Taylor, 2001) This study employs the constructivist paradigm proposed by Guba and Lincoln (Creswell & Miller, 2000), which takes the view that it is not possible for researchers to identify a single, objective reality. In keeping with this paradigm, assessment of this research therefore takes its context into account and considers its dependability, transferability, credibility and confirmability (Trochim, 2008).

Credibility involves establishing that the results of the research are credible from the perspective of the participant (Trochim, 2008). In this study, use of interview data from conference participants increased the credibility of the interpretation of conference data because this analysis was triangulated with the accounts of participants. In addition, carrying the interviews out through email supported reflexive consideration of the affordances of asynchronous dialogue for learners on the part of the researcher as well as on the part of those interviewed.

Dependability emphasises the need for the research to account for the context in which it takes place, and can be considered to be analogous to the criterion of reliability in quantitative studies (Trochim, 2008). Following three groups increased the dependability of this study, as observations made in one group could be checked against others. The comprehensive record of group interaction that made up the data set was also important in this respect, because it preserved much of the context of the interaction for study.

Observations made in Jet and Pearl groups, which shared tutors and discussed the same data and methods of analysis, were triangulated with observations made in Sapphire, which had a different tutor and a different research project. This analysis of conference data was, in turn, triangulated with analysis of interview data. The comparison of comparable datasets added to the dependability of the study by demonstrating that the same features could be observed in different groups engaged in similar activities. This dependability was increased by comparing conference data from the main study with a similar set of data, collected two years earlier by different researchers, that was used in the pilot study.

The transferability of research refers to the degree to which it can be generalised or transferred to other contexts or settings (Trochim, 2008). The checks on dependability outlined above indicated that the results of the study would be generalisable to other learners working together in small groups for extended periods of time and communicating asynchronously. However, certain significant characteristics of the dataset limit the transferability of the results.

The groups all had fewer than ten members and were encouraged to interact as equals, without appointing leaders. They interacted using FirstClass software and were both resourced and constrained by this specific medium. Group members worked together entirely online and had no opportunities to get to know each other in a face-to-face setting. They were both focused and assessed on the collaborative development of a group project, and so failure to work together would have had serious consequences, especially for those who needed to pass the course in order to progress in their chosen career. Further research would be required to investigate whether the findings of this study are applicable to groups that do not share these characteristics.

Confirmability refers to the degree to which results could be confirmed or corroborated by others (Trochim, 2008). This is an important aspect of sociocultural discourse analysis,

because this method is transparent, presenting data alongside its analysis, so that readers can judge for themselves how representative the conclusions are. In this study, conference postings have been presented as screen shots, and sections of the data have been preserved in their original form and presented in Appendix E and Appendix F. The findings have also been compared with the conclusions of similar studies, including the unpublished results of the study for which the pilot data was originally collected.

8.5.2 Data analysis

To analyse the data corpus, this study applied sociocultural discourse analysis and visual analysis to the conference material and thematic analysis to the interviews with students and tutors. The thematic analysis was used to extend both the scope of the study and its dependability. Key themes identified by students and tutors from different project groups were used to inform and support analysis of the conference data. This was particularly useful in the identification and analysis of unproductive interaction, which was not easily apparent in the conference material but was a recurrent theme in the interview data.

Thematic analysis could have been carried out in other ways, and this would have affected the credibility of the conclusions. The researcher could have identified themes at the start, and then coded the data according to these, as in content analysis. This would have lowered the credibility of the study by imposing the researcher's preconceptions on participants' account of their activity. It would also have introduced the problems of content analysis discussed in Chapter 3 and summarised below. Conversely, thematic analysis of interview data could have been used to drive the research. This would have produced a slight increase in the credibility of the results, but would have made it less likely that the research questions could be addressed.

The majority of the data were subjected to sociocultural discourse analysis and visual analysis. The first of these methods was originally developed in order to analyse the use of

spoken language as a group tool (Mercer, 2004). Although it had been used successfully to analyse transcriptions of educational dialogue, it was not designed for the study of online communication and therefore offered no scope for analysis of visual elements of the data such as colour and layout. Nevertheless, it proved more useful in this context than content analysis, which had been the method favoured by the majority of previous researchers.

The pilot study, reported in Chapter 3, identified problems with the use of quantitative content analysis. This method constrains researchers in this context by requiring them to identify a basic unit of analysis, to draw up a limited coding scheme made up of a set of mutually exclusive categories and to apply a single code to each unit. The method is unsuited to the study of such varied data as attachments and postings, and its use would have limited the study's focus to just one form of knowledge building.

Sociocultural discourse analysis was more appropriate, partly because its theoretical basis is rooted in the sociocultural views that learning involves participating in cultural practices and that learning activities can never be seen separately from the context in which they take place. It therefore requires the data to be retained as a whole for analysis. Leaving contextual cues in place in this way supported analysis of talk in a temporal context as well as analysis of the relationships between interactions that occurred at different times. In addition, the method added to the confirmability of the study.

Although sociocultural discourse analysis was designed for the study of dialogue, it had little to say about the multimodal aspects of asynchronous communication because it had not previously been applied to textual data. Typographical and layout elements provide many of the back channels of online dialogue; they are the non-verbal communicative acts that help to structure the discourse. Because of the significance of these visual elements, it was necessary to analyse the composition of the dialogue alongside its content.

This visual analysis focused on the spatial and temporal features that integrate the various elements of a text, particularly the structuring principles that they share: salience, perspective, balance, vectors, reading paths and frames. Consideration of these structural elements complemented the sociocultural discourse analysis, bringing together analysis of both verbal and visual elements.

8.6 Methodological contribution

As the combination of sociocultural discourse analysis, visual analysis and epistolary interviews proved useful for the study of asynchronous dialogue, summaries of these methods are provided below for the benefit of future researchers.

8.6.1 Sociocultural discourse analysis of asynchronous dialogue

This form of analysis is concerned with the content and function of dialogue, with its cohesive nature and with the ways in which shared understanding is developed over time in a social context. To achieve this, it combines detailed analysis of dialogue in specific events with comparative analysis across a sample of cases.

This method retains the data as a whole for analysis. In the case of asynchronous conference material, it proved useful to have the posting data available in three forms: as searchable text, as images and in the original conference. Data collection was not confined to the text of conference postings, but included attached files, the message histories that gave details of when postings and attachments had been created and accessed, plus images of the appearance of the conferences and the postings within them

File attachments were stored as online files. Text and image files were printed out for analysis but others, such as attachments including animations or sound files, were analysed on screen. Elements of attached files that would have been lost in printed versions included the information about the file's author and dates that is stored in the 'information' section

of the file; sounds, notes and animations in a PowerPoint file; comments in a Word document, and the calculation facilities built into SPSS files.

Searchable text allowed conference postings to be printed out so that many could be viewed at a time, specific instances could be compared side by side, and the effects of ordering by author, title or date could be compared. Images preserved elements such as icons, colour, shading and layout, and also preserved elements such as text history that cannot easily be converted to text files. If the original conferences become inaccessible or are deleted, the text and image files preserve much of the data. Nevertheless, retaining the original conference had many advantages: it supported shifts from the researcher's perspective to an experience more akin to that of a member of the conference, the original conference often proved easier to negotiate than printed files, and it could be viewed on a variety of screens and devices to recreate the experience of different users.

Postings were stored in tables in Word documents, which meant they could be sorted by column. The six columns used for this research were: post author, date of post, time of post, title of post, whether the post was associated with an attachment, and at which position in a thread the post appeared. The latter column was useful because it avoided a request to 'Sort by title' resulting in all titles starting 'Re:' being grouped together. In order to keep the table for each conference to a manageable size it was necessary to reduce the point size of the type – after ensuring that the original posting layout and type size had been recorded.

Pasting conference data into a table involved repeating similar actions thousands of times. Computer users carrying out similar work have developed repetitive strain injury (RSI), so it proved important to take screen breaks, and to spread this archiving work over several weeks. 'Snag-It' software offered a text-grab facility on scrolling windows that reduced the workload by making it possible to cut and paste lists of dates, times and titles of

conference postings. For those archiving FirstClass conferences in this way, more details are available online (Ferguson, 2007).

Images of message histories, icons and conference home pages were stored as screen grabs. A document was also created for each conference giving details of participants, type sizes and styles used, associated folders, attached documents and the dates when the conference was in use. Another document included more details about attached documents, including the text of the posting with which they were associated, their title, the person who had posted them, and details of any documents to which they were related.

Once the conferences had been archived, sociocultural discourse analysis of the text files was carried out as described by Mercer (2004). Appendix G includes images representing the start of analysis on the text files of Sapphire group's conference. For clarity, columns relating to threading and attachments have been removed and, for ethical reasons, the names of individuals, groups and courses have been replaced by pseudonyms. The 14 postings shown in the appendix include examples of constructive synthesis, the proposal pattern and powerful synthesis. These images represent one stage in an iterative process that involved moving between text files, image files and the online conference in order to compare representations and interpretations and to investigate how meaning was conveyed through text, layout and online affordances.

8.6.2 Visual analysis of asynchronous dialogue

In this case the analysis began with the text, identified elements of sense-making and knowledge construction that could not be explained solely by the exchange of words, and then moved to visual analysis. For example, the twelfth posting in Sapphire conference contained a series of ideas for experiments the group should carry out. The following posting narrowed the selection to one, and the posting after that set that suggestion aside and replaced it with a new one (Appendix G contains the text file of these postings).

Analysis of the text could not explain how and why this happened. Visual analysis suggested considering how the postings were balanced, how certain elements were made more salient, and how this was achieved elsewhere in the conferences. Elsewhere in Sapphire conference the text files made it difficult to distinguish between new comments and quoted comments in postings. Visual analysis suggested that vectors and frames might be used to create reading paths through the text. A move to images of the postings showed that colour and shading could be used to build these reading paths and made it possible to compare responses to messages with clear reading paths, and responses to messages where the reading paths were absent or misleading.

The six structuring principles of spatial composition identified by Kress and van Leeuwen (1990) were used to guide and inform visual analysis. Salience, perspective and balance proved to be most useful in providing ways of approaching the data, asking how items were made more salient, how the balance of a posting was achieved and what effect different perspectives would have when examining a posting or attached document. As the analysis in Chapters 5 and 7 shows, the structural principles of frames, vectors and reading paths could be mobilised to provide answers to these questions.

8.6.3 Epistolary interviews to support analysis of asynchronous dialogue

Analysis of conference data was supplemented by thematic analysis of the epistolary interviews described in Section 4.3. This allowed exploration of silence, which the other forms of analysis interpreted only as an absence of data. Interview data pointed to the different roles of silence, and to its importance. These findings were unexpected, and would have been missed if the interviews had not been carried out. The interviews also uncovered some of the multiple contexts of the online groups, providing details of how students and tutors experienced the conferences and how they interpreted the exchanges within them.

When carrying out the epistolary interviews, staff and students who responded positively to an initial contact email were emailed more details of the interview and the first question. The initial email notified recipients of the purpose of the research and the information that participation was voluntary, that it would not affect their standing with the university, and that they would be free to withdraw at any time. The address of a website containing this information was provided on all emails. The website also contained a brief summary of the project, information about epistolary interviewing, the interview questions and information about the research.

All students were asked the questions listed in Appendix B, and all staff were asked the questions listed in Appendix C. This provided a degree of standardisation within an informal interview framework, ensuring the main questions were always phrased in the same way and asked in the same order; and increased reliability by ensuring consistency between respondents. Although the interviews were based around these questions, the epistolary nature of the interviews and the conversational style adopted meant that questions and issues suggested by analysis of conference data or raised in other interviews could be used to inform these exchanges.

The interviews were carried out after the students had completed their coursework, to avoid the possibility that their behaviour in the conferences would be influenced by the knowledge that their interactions would form part of a study. Other options, for future studies, would be to carry out interviews while a course was running, or to personalise interviews to allow tutors and students to reflect on their online learning and interactions.

8.7 Weakness and limitations of this research

Ideally, analysis would have been extended to other groups on the course, and to asynchronous groups on other courses. Interview data suggested that specific project groups would have been of particular interest. However, ethical considerations meant that

conference data from other groups was not accessible because not all members had consented to have their contributions analysed. As each tutor worked in several project groups their agreement was particularly significant, because the lack of a consent form from a single tutor could eliminate as many as six project groups from the study.

As sourcing data proved extremely time consuming, it was not practical to collect data from more than one course. Once a suitable course that fitted the requirements of the data had been identified, permission had to be obtained from gatekeepers, ethical clearance gained, over 700 students and staff contacted, consent forms checked against group lists and then the extensive conference data accessed and archived.

Section 8.5.1 noted that a weakness of this research lay in its lack of transferability. The groups studied shared several characteristics that are not typical of online learners. The members of these groups were part-time distance learners, and the majority were mature students. Online interaction was carried out through the medium of FirstClass, which is only one of a range of online tools and learning environments that may be used for such courses. Unlike those enrolled at campus-based universities, group members had little or no opportunity to meet face to face either informally or on other courses. Further research would be required to investigate whether the findings reported here are applicable to other groups constructing knowledge together in other asynchronous settings.

8.8 Agenda for future research

Section 8.5 suggested two specific areas for future research leading on from this study: an extension of this research to groups of learners in different contexts, and an investigation of the roles of silence within online educational dialogue. Section 8.4 showed that this research has important implications for the pedagogy of online courses that could affect course development in terms of learning outcomes, assessment and scheduling. This

research also suggests that tutors would benefit from support and training to prepare them for their role as discourse guides in these settings.

The scope of the study indicates that these conclusions are dependable in the context of the course studied, but it is not clear whether they are transferable to all courses in which learners communicate using asynchronous dialogue or only to a subset of those courses. The conclusions are also limited because this study focused on group interactions between learners. A more extensive study would have given more weight to the role of the tutor. Because the importance of the tutor as a discourse guide was demonstrated here and has also been identified in other contexts (Littleton & Whitelock, 2004), the role and the influence of the discourse guide in a range of asynchronous settings need to be explored.

The second area for future research identified in Section 8.4 was the role played by silences in online educational dialogue. This study identified different categories of silence (Section 6.2): the strategic silence used to mask the individual or to avoid unproductive interaction, the silence of an absent member of the group, and the silences interpreted as signs of exclusion. These categories were difficult to identify and to study, because the methods of analysis were not equipped to deal with an absence of data. The interview data drew attention to problems associated with the use and interpretation of silence within the conferences, but did not identify associated benefits. Neither was it clear what cues learners and tutors used to interpret silence or why it was so commonly used as a strategy when its interpretation was clearly ambiguous. A future study might address these issues through the use of interviews, focus groups and participant observation.

A third area for further exploration relates to improvable objects. The importance of these objects to the development of exploratory dialogue and progressive discourse in online settings had not previously been identified. The role they play in online learning is particularly important due to the recent increase in the educational use of both synchronous

online communication and condensed asynchronous forms of dialogue such as microblogs. This study suggests that educational dialogue through these media may be impoverished because a lack of improvable objects reduces opportunities for engaging in challenges, counter-challenges, explanations and justifications while avoiding unproductive interpersonal conflict. There is therefore an urgent need to examine the skills and literacies required to initiate exploratory dialogue within these media.

In addition to these three subjects for future study, this study supports a broader research agenda. It has shown that cumulative dialogue, exploratory dialogue and improvable objects can usefully be employed as analytic concepts to support understanding of the co-construction of knowledge in online settings. It has also shown that sociocultural discourse analysis can be used, alongside visual analysis, to increase understanding of online educational dialogue. In future, these tools will be available to researchers studying knowledge building amongst different groups of online learners.

8.9 Conclusion

This thesis has described the significant theoretical, methodological and educational contributions to knowledge that have been made by this research. It has shown that concepts and analytic methods developed to aid understanding of classroom learning can be developed to support understanding of text-based educational dialogue. With the help of these, it has demonstrated that asynchronous dialogue can be far more detailed and complex than face-to-face talk and that to groups of learners it offers affordances that are not available in face-to-face situations. By investigating a wider range of conference data than has previously been explored, it has shown that attached dialogue prompts groups of learners to share knowledge, challenge ideas, justify opinions, evaluate evidence and consider options in a reasoned and equitable way. It has stressed the importance of online knowledge-building work integrating social knowledge, tool-based knowledge and task-

based knowledge. In doing these things, the study has achieved its primary aim: to increase understanding of the skills and meaning-making tools that support the shared construction of knowledge in asynchronous settings.

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Appendix A: Coding scheme and notes for coders

Coding for approaches to study

This coding is intended to reveal whether a participant in an asynchronous conference is predominately using a deep, strategic or surface approach to study.

1. Messages posted by psychology students to a FirstClass conference are presented as units for analysis. They contain references to other conference participants, their tutors.
2. Each unit should be coded as a whole to indicate the type(s) of data it contains.
3. Some units contain no relevant data and are coded U. These are usually brief messages such as 'Yes, I agree' or messages that serve a social purpose. Only 2-3% of messages come into this category.
4. There are 18 codes, six related to deep approaches, six related to strategic approaches and six related to surface approaches. Codes with the same number (De1, St1 and Su1, for example) are related. Codes with the same number can be applied to the same message, but consider whether one is more appropriate than the others.

   Category 1: Course material
   Category 2: References
   Category 4: Responses
   Category 5: Tutor
   Category 6: Focus
   Unclassified
5. Most messages will need fewer than four codes. On average, a unit will receive **two** codes.
6. If a message appears to fit into several categories, consider which is the best fit in relation to 'Approaches to Study'. Deciding whether it is an initiation or a response may also help you make a decision.
7. Check your decisions by coding twice and comparing versions to produce your final coding.

Course material	
De1	Demonstrates understanding of / interest in current course material (including data supplied by course).
St1	Refers without anxiety to current course material (including data supplied by course).
Su1	Expresses anxiety about complexity of current course.
References	
De2	Demonstrates understanding of academic writing, academic software (eg SPSS, NVivo) or statistics.
St2	Gives appropriate reference(s) without demonstrating understanding of their content.
Su2	Gives inappropriate reference(s) or states they cannot locate appropriate references.
Initiates	
De3	Initiates discussion or ideas / proposes courses of action which relate to understanding.
St3	Seeks to develop project in line with assessment criteria / practical concerns.
Su3	Supplies data without significant comment.
Responds	
De4	Responses to students' data or input relate to theory / understanding
St4	Responses to students' data or input relate to assessment criteria / practicalities.
Su4	Responses to students' data or input unsupported / approves ideas solely because they are easy.
Tutor	
De5	Comments on / questions input of tutor
St5	Agrees with tutor / asks tutor about assessment-related issues / practicalities.
Su5	Asks tutor to do work for them.
Focus	
De6	Demonstrates interest in learning
St6	Meets, tries to meet or asks students about assessment criteria / organises time / orients to deadlines
Su6	Expresses concern about work, marks or deadlines / struggles / needs reassurance.
Unclassified	
U	Can't be classified. Very brief or primarily social remark.

Appendix B:

Interview questions for students

1. Could you tell me a little about why you chose this course? Have you studied online before?

2. Have you worked in groups before? Do you enjoy working in groups?

3. How do you let others in your group know about yourself? Do you think they understand how you are working and how you are feeling?

4. Do you only use messages in the FirstClass conference to communicate with other members of your group or do you communicate in other ways (chat, phone, email, text, blogs, meetings etc)? How do you choose which method to use?

5. What is it like to work with other people you have only met online? Do you feel you make a good team?

6. What are the main advantages of doing a collaborative project online? Could you give examples?

7. What are the main disadvantages of doing a collaborative project online? Could you give examples?

8. Have there been any problems in your group? If so, how have they been resolved?

9. How do you feel about group work now? What would you do differently if you did group work again?

10. Is there anything else you would like to tell me about your experience of working together online?

Appendix C:

Interview questions for staff

1. Could you tell me how long you have been involved in online learning and a little about why you chose to work on DZX999?

2. In which ways do you communicate with members of your groups (FirstClass, chat, phone, email, text, blogs, meetings etc)? How do you choose which method to use?

3. What are the main challenges when students are first assigned to a project group? How do you deal with these challenges?

4. What are you hoping to achieve as a project group tutor? What are your main strategies for achieving this?

5. What have you experienced as the main benefits and challenges of team teaching?

6. Think of a DZX999 project group in which participants have worked well together, either on this presentation or in the past. What do you think made them so successful? How could you tell that they were working well together?

7. Think of a DZX999 project group in which participants have had trouble in working together, either on this presentation or in the past. What do you think gave them the most problems? How could you tell that they were struggling?

8. What are the main advantages and disadvantages to your students of undertaking a collaborative project online? Can you give examples?

9. What are the main problems your project groups have experienced? How have they resolved them?

10. What are the main differences between online teaching and face-to-face teaching?

Appendix D: Transcripts, authors and key features

Pearl group transcripts

No	Author	Date	Time	Description	Words
1	Rita	21 Nov	13.23	Initial version of the transcript	1028
2	Andrea	21 Nov	16.16	Slightly altered version included in a posting.	1057
3	Andrea	24 Nov	18.54	Identical to Transcript 2. Included in a posting.	1057
4	Rita	27 Nov	13.30	Substantially amended. Includes body language	1342
5	Charlene	1 Dec	23.13	Amended versions with changes marked in purple	1371
6a	Charlene	2 Dec	17.36	Corrected version of dialogue	1164
6b	Charlene	2 Dec	17.36	Corrected dialogue plus body language.	1469
7a	Charlene	3 Dec	17.43	Dialogue, body language and camera movements	1633
7b	Charlene	3 Dec	17.43	Dialogue and commentary	1158
7c	Charlene	3 Dec	17.43	All elements combined	1638
8	Ethan	3 Dec	19.46	Amended version of Transcript 4	1459
9	Andrea	4 Dec	19.30	Another amended version of Transcript 4	1475
10	Ethan	6 Dec	10.44	Version posted in error	1472
11	Ethan	6 Dec	10.55	Collated version of all previous transcripts	1555
12	Charlene	9 Dec	16.30	Minor amendments to line numbering	1562
13a	Charlene	16 Dec	12.44	Reference version sent to Andrea	1562
13b	Charlene	16 Dec	12.44	Variant reference version sent to Andrea	1555
				Total word count	23577

Jet group transcripts

No	Author	Date	Time	Description	Words
1	Olivia	21 Nov	22.21	Initial version of the transcript	341
2	Heather	22 Nov	18.11	Different version of the transcript	704
3	Maggie	22 Nov	22.44	Builds on Transcripts 1 and 2	850
4	Maggie	22 Nov	22.52	Identical to Transcript 3	850
5	Hannah	23 Nov	09.39	Version of Transcript 1	330
6	Hannah	24 Nov	12.23	Includes some transcription of visual element	816
7	Hannah	25 Nov	08.57	Includes changes to layout	845
8	Glenn	27 Nov	21.25	Changes to line numbering	845
9	Hannah	28 Nov	09.20	Near-complete version	863
10	Hannah	28 Nov	13.34	Amended in line with comments	863
11	Eileen	30 Nov	12.40	Author is not happy with this version	955
12	Eileen	30 Nov	15.59	Author amends her previous version	907
13	Eileen	30 Nov	17.31	Corrected version of first 40 lines	907
14	Eileen	1 Dec	11.35	Corrected line numbering	893
15	Maggie	3 Dec	18.02	Changes to layout	978
16	Maggie	4 Dec	12.48	Final agreed version	978
				Total word count	12925

DZX999
Project Group: Jet

Transcript of Video Clip 2

Large brackets ([]) indicate simultaneous speach, a slash(/) indicates interuptions. Italics indicate non-verbal behaviour. Gaps between lines indicate edits from one shot or sequence to another. Only lines contained in continuous sequences have been numbered.

Teacher: So now coming on to the whole issue of how langauge can be used in a sexist way, language can be used to keep sombody down.

Narrator: Language and power and stereotypes about acccent and dialect are issues which Kit wants pupils to look at in more detail. He breaks the class up into small groups and this more relaxed and informal setting influences the way the girls can explore the issues.

Girl 2: (*animatedly*) Cos thats what...Cos you know my cousin? She's from Bradford..
Girl 3: [Yes, yeah
Girl 2: [.. you know when she starts talking I start copy .. you know, imitating ..
Several: [Yes,yeah
Girl 2: [.. what she's saying, she gets really angry and she goes 'you can't talk proper', [I go 'what?'
Girl 3: ['You can't talk proper' *(imitating and bobbing head from side to side)*
Girl 2: [**'**You can't talk proper!'
Girl 4?: [It's true
All: (*collective laughing*)
Girl 2: It doesn't really mean anything just, you know, you don't talk like me.
Girl 1: (taps pencil on table)
Girl 5: We're forever taking the mickey out of peoples accents
[though if you think about it, in't ya?
Girl 3: [Yeah, I know
Girl 1: (*Animatedly. Pointing pencil at Nazeera then herself*) No but the thing is some people think, you know, in the country like in Sheffield or Leeds.
When I went there, I've got this accent and everybody said 'you've got an [..a London Accent
Girl 3: [Yeah, they say you've got an accent.
Girl 2: [Yeah, where do you come from..
Girl 1: ['I mean are you, are you rich or something?'
Girl 3: (*laughing* **)**'are you rich?**'**
Girl 1: ...(*elbows on table, pen in right hand, playing with hair/hand around left ear*) they assume if you live in London and you/
Girl 5: /People think I'm right common cos of [my accent.
Girl 2: [but you, but Anjana has like got a bit of a posh accent
Girl 5: [Yeah, you've got quite a ..

Girl 2: ⌊Cos you know when I talk to you I talk differently than I would talk if I was like talking to Zera, Natalie or Nazia. (*hands animatedly*)

Girl 5: ...I talk about actual words like proper... we say 'bu*tt*er', you'd probably say 'butter.'

All: "Butter".

Teacher: What I'm hoping is happening is that especially those people who aren't prepared or haven't got the confidence or at that particular moment haven't got a strong idea that they could share in front of a larger group,that they feel more comfortable in a smaller setting and that they're more willing then to, to share an idea or to come up with some suggestions and there is also the whole idea of of developing um the sort of listening skills that they're actually contributing and listening and then reacting to what they have heard and that, that is a very difficult thing for them to build up. [*Girls talking together again, giggling*]

Girl 1: You wouldn't talk proper to a cockney or anyone like that would you?..

Others: No, no. Its true

Girl 1: ..and a cockney would say ⌈that cockney would be proper for them,

Girl 5: ⌊If someone like ...

Girl 1: ...talking to them, but with a posh person you have to try and speak them but in an argument...I mean what kind of..what do you speak in argument?

Girl 5: Yeah but an argument is like I...I go cock, ⌈basically cockney...

Girl 3: ⌊You do, you do repetition

⌈aswell, repetition

Girl 5: ⌊.., really cockney

Girl 4: ⌈You don't say all that many words

Girl 1: ⌊I mean in a argument you're interrupting both sides, you won't be speaking properly would you? (*waving pencil*)

Girl 2: Yeah but it depends what you mean by 'speaking properly'/

Girl 3: /'Speaking properly'. You've got..explain what you think it means.

Narrator: Kit allows the girls to develop their own agenda in this kind of discussion, they use anecdote and personal experience to explore the issues.

Unknown: You know something

Repeat of previous clips

Girl 2: You know my cousin? She's from Bradford ..

Girl 3: ⌈Yes, yeah

Girl 2: ⌊.. you know when she starts talking I start copy .. you know, imitating ..

Several: ⌈Yes,yeah

Girl 2: ⌊.. what she's saying, she gets really angry and she goes 'you can't talk proper'

Girl 1: Like in Sheffield or Leeds. When I went there, I've got this accent and everybody said 'you've got an ⌈..a London Accent

Girl 3: ⌊Yeah, they say you've got an accent.
Girl 2: ⌈Yeah, where do you come from..
Girl 1: ⌊'I mean are you, are you rich or something?'

Girl 2: Anjana has like got a bit of a posh accent
Girl 5: ⌈Yeah, you've got quite a ..
Girl 2: ⌊Cos you know when I talk to you I talk differently than I would talk

Narrator: But it's not just a string of stories. As they share experiences they draw out generalisations and confront contradictions, pulling out points that will surface later in their writing.

Girl 4: You talk differently don't you in different situations.

Unknown: Does your mum speak quite posh as well?

Girl 5: We're forever taking the mickey out of peoples accents
⌈though if you think about it, in't ya?
Girl 3: ⌊Yeah, I know

Girl 2: Yeah but it depends what you mean by 'speaking properly'/
Girl 3: /'Speaking properly'. You've got..explain what you think it means.

Teacher: Most important thing to remember.....

Consolidation of our analysis

To make it easier I have coloured coded our results, and put our names in front of it.
Charlene, Ethan, Andrea, Rita.

Lines we all commented on and our comments.

15

Charlene: The Doctor is very patronising , and casting doubt in the confidence of the patient straight away, by saying that he guesses the patient doesn't remember too much about what he has told him.

Ethan: Doctor's tone indicates a slight disinterest in the notes and desire to move onto finding out information from the patient about what he remembers of the procedure. He also assumes the patient does not remember a lot. He is making a negative assumption about the patient, which may be interpreted as a desire to be seen as the knowledgeable party. This could be seen as an attempt at power.

Andrea: The doctor in a show of confidence and authority makes direct eye contact with the patient and tells him in a patronising way (as if to imply he would not be able to remember what he had previously been told in earlier conversations) about what he had been told before.

Rita: The use at times of almost childish language by the doctor looks to be belittling of the patient and the communication of the patient becomes more and more quiet, with only softly spoken, (yeah) which becomes more prominent when the doctor talks about the possible consequences of the operation.

18

Charlene: When the patient replies, and takes control of the conversation, to the doctor he stutters and says eh a lot which shows he is uncomfortable, nervous and lacks confidence in his answer.

Ethan: As the patient replies the GP immediately reopens his notes and laughs. Again he has failed to remain in eye contact when awaiting a response to his questions. It could be that his questions are standard and he is not really interested in hearing the response. Patient laughs and continues speaking after a slight pause where he may be awaiting being given due attention again. When considering why the patient would be laughing at such a procedure it may be that he is being influenced by the GP levity. The patient may be becoming confluent with the GP and losing his ability to reflect personally on his decision making.

Andrea: The patient however gains the upper hand here and responds with a brief description of what he thinks is going to happen to him with the operation.

Rita: The clip also shows that initially the patient has the "courage" to be part of the conversation but through intimidating behaviour both in verbal language and non-verbal communication the doctor asserts his power within the conversation.

22

Charlene: Again the Doctor is patronising to the patient by saying '...that's a pretty good memory … actually …. not quite like that but.'

Ethan: GP comments on patients memory ability rather than commenting on accuracy of detail. He makes a value judgment on his patient and thus again could be seen as assuming a position of knowledge and power over this patient.

Andrea: The doctor once again shows his authority by drawing on his expertise and elaborates on the patients description, (giving the doctor power once again) giving a more detailed analysis about the procedure involved (including hand gestures) to explain the operation and where on the body it would take place.

Rita: Throughout the video-clip the doctor shows authority in his field and is trying to build a relationship with his patient, to alleviate the patient possible concerns about the operation, which is

more evident in the non-vebal communication than the verbal communication. At times the authority changes into the relative power with the doctor, both in terms of the way and intonation of the doctor speech but also in the language used by the doctor. The clip also shows that initially the patient has the "courage" to be part of the conversation but through intimidating behaviour both in verbal language and non-verbal communication the doctor asserts his power within the conversation. The patient then start to show subservient behaviour not only that he only injects a quiet "yeah" through the doctor monologue but also in terms of the way he sits on the bed. The use at times of almost childish language by the doctor looks to be belittling of the patient and the communication of the patient becomes more and more quiet, with only softly spoken, yeah) which becomes more prominent when the doctor talks about the possible consequences of the operation.(for patient see previous lines,

35

Charlene: Throughout the rest of the conversation the patient is very submissive towards the Doctor as he is constantly nodding and agreeing with the doctor.

Ethan: GP uses a dressmaking analogy to help patient understand the procedure. He shows a willingness to impart information in non-technical terms.

Andrea: The doctor once again shows his authority by drawing on his expertise and elaborates on the patients description, (giving the doctor power once again) giving a more detailed analysis about the procedure involved (including hand gestures) to explain the operation and where on the body it would take place.

Rita: Throughout the video-clip the doctor shows authority in his field and is trying to build a relationship with his patient, to alleviate the patient possible concerns about the operation, which is more evident in the non-vebal communication than the verbal communication. The clip also shows that initially the patient has the "courage" to be part of the conversation but through intimidating behaviour both in verbal language and non-verbal communication the doctor asserts his power within the conversation.

36

Charlene: Throughout the rest of the conversation the patient is very submissive towards the Doctor as he is constantly nodding and agreeing with the doctor.

Ethan: GP uses a dressmaking analogy to help patient understand the procedure. He shows a willingness to impart information in non-technical terms.

Andrea: The doctor once again shows his authority by drawing on his expertise and elaborates on the patients description, (giving the doctor power once again) giving a more detailed analysis about the procedure involved (including hand gestures) to explain the operation and where on the body it would take place.

Rita: Throughout the video-clip the doctor shows authority in his field and is trying to build a relationship with his patient, to alleviate the patient possible concerns about the operation, which is more evident in the non-vebal communication than the verbal communication. The clip also shows that initially the patient has the "courage" to be part of the conversation but through intimidating behaviour both in verbal language and non-verbal communication the doctor asserts his power within the conversation. The patient then start to show subservient behaviour not only that he only injects a quiet "yeah" through the doctor monologue but also in terms of the way he sits on the bed.

40

Charlene: Throughout the rest of the conversation the patient is very submissive towards the Doctor as he is constantly nodding and agreeing with the doctor.

Ethan: GP describes procedure but fails to stop and check the patients understanding of it. He has either overlooked this important aspect or he has decided that he is himself is the only party he needs to understand the procedure which may be seen as adopting a position of power.

Andrea: The doctor once again shows his authority by drawing on his expertise and elaborates on the patients description, (giving the doctor power once again) giving a more detailed analysis

Appendix G: Analysis of conference dialogue

The following illustrations are based on the first postings made in the Sapphire Group conference. The dates, times, titles and text of these postings have been added to a Microsoft Word table. In this appendix, names of individuals, groups and courses have been replaced by pseudonyms. Columns of the original table giving information about attached documents and threading of conversations have been omitted here in order to provide images that can be read easily.

The images here represent a first pass through the data to indicate areas of interest. Subsequent, on-screen, analysis would deal with the visual elements of layout, colour and shading that are not represented when data is pasted into a table to be viewed together.

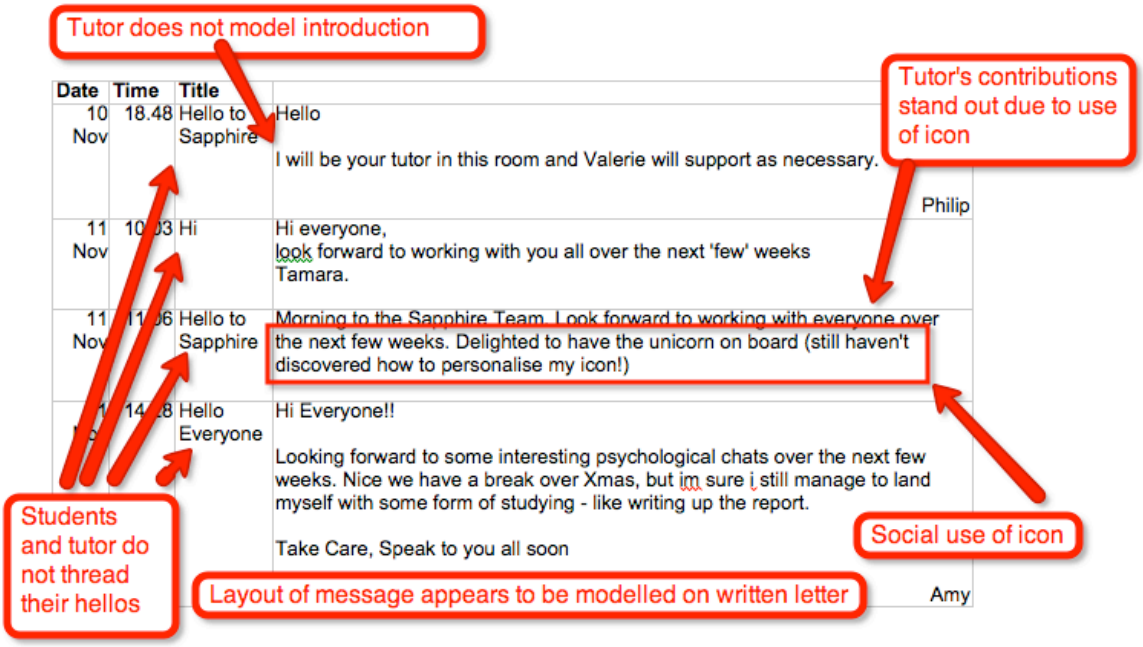

Figure G1: Sapphire conference, postings 1-4

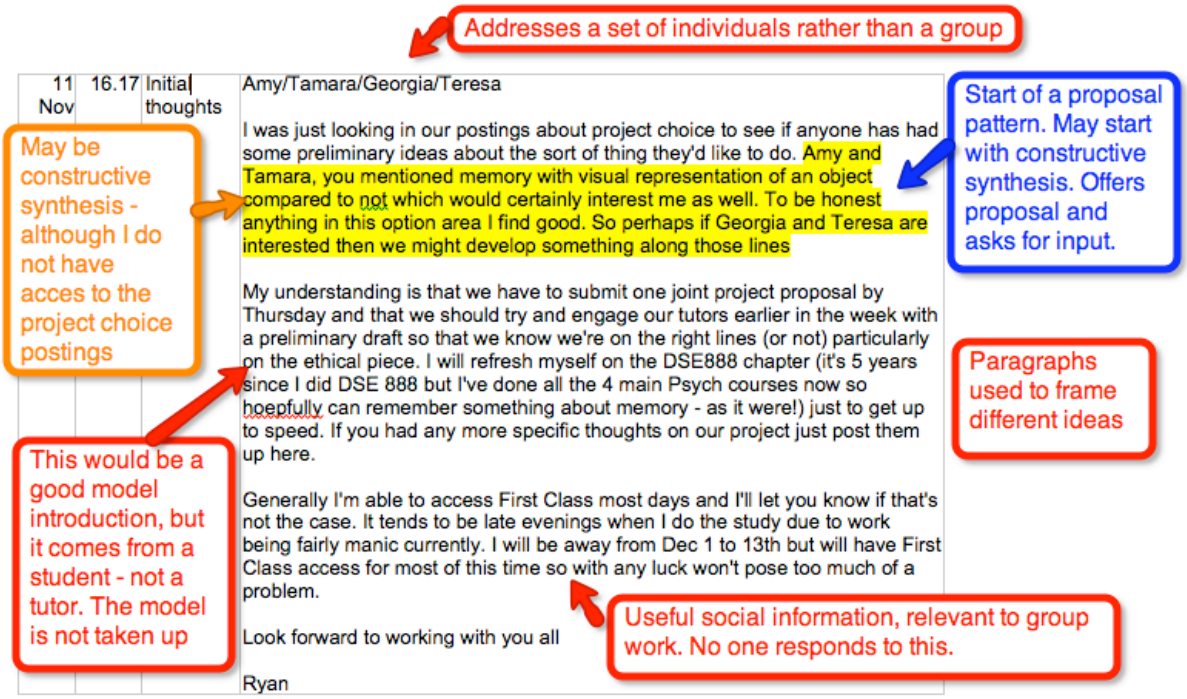

Figure G2: Sapphire conference, posting 5

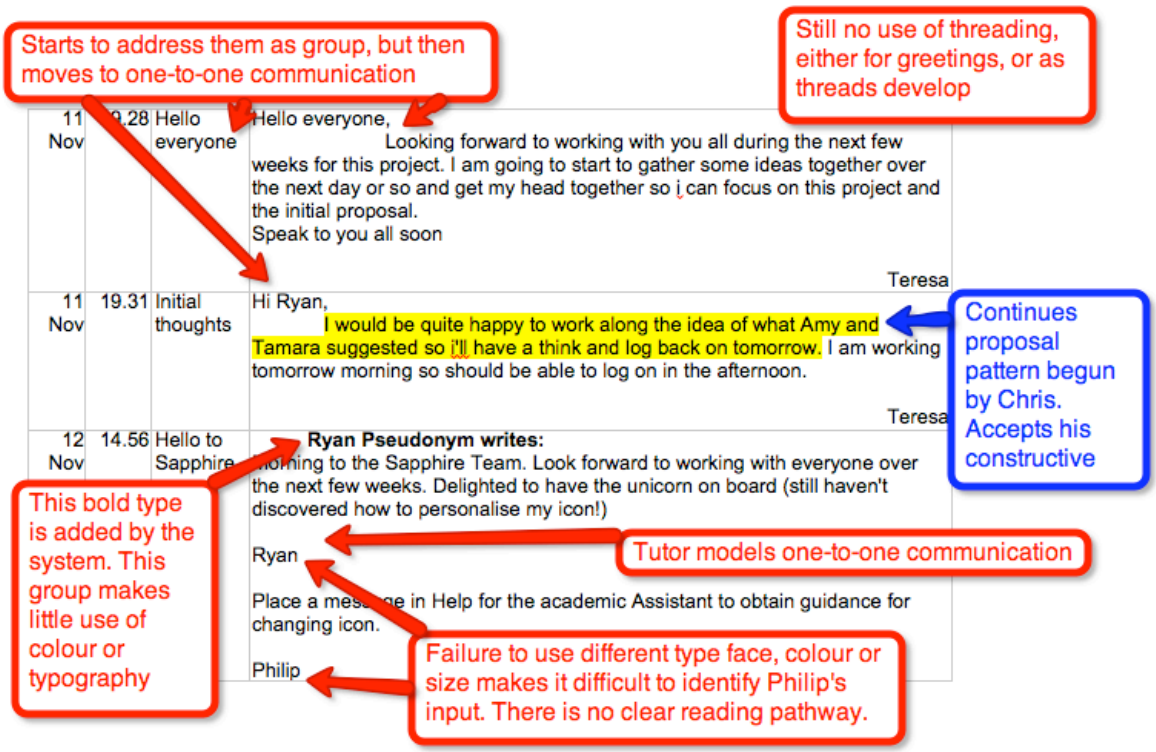

Figure G3: Sapphire conference, postings 6-8

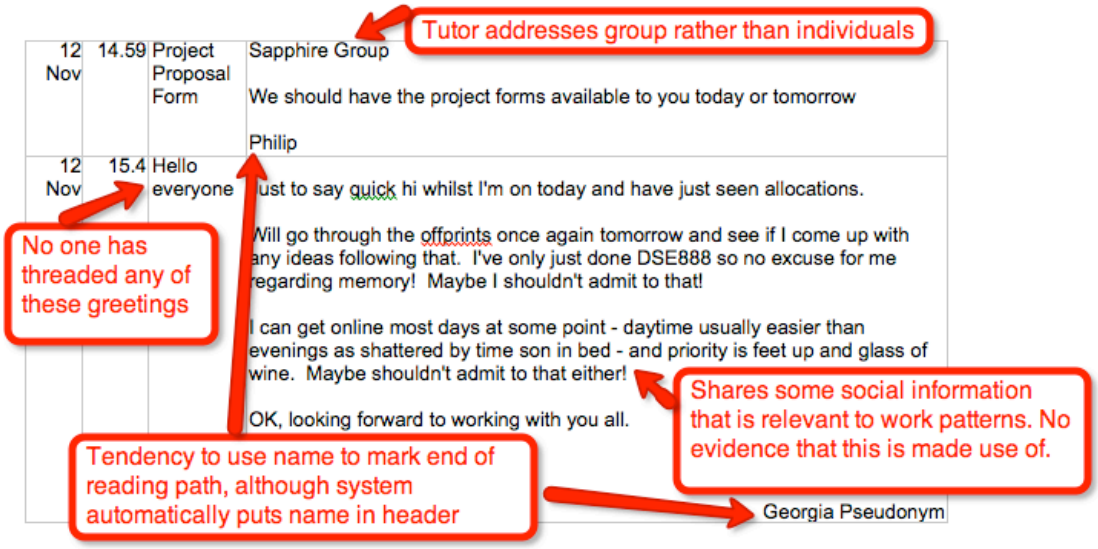

Figure G4: Sapphire conference, postings 9-10

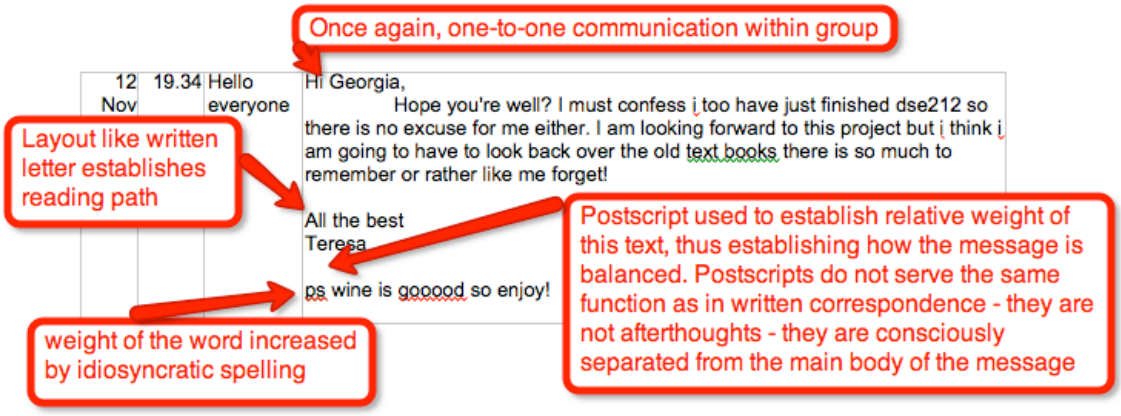

Figure G5: Sapphire conference, posting 11

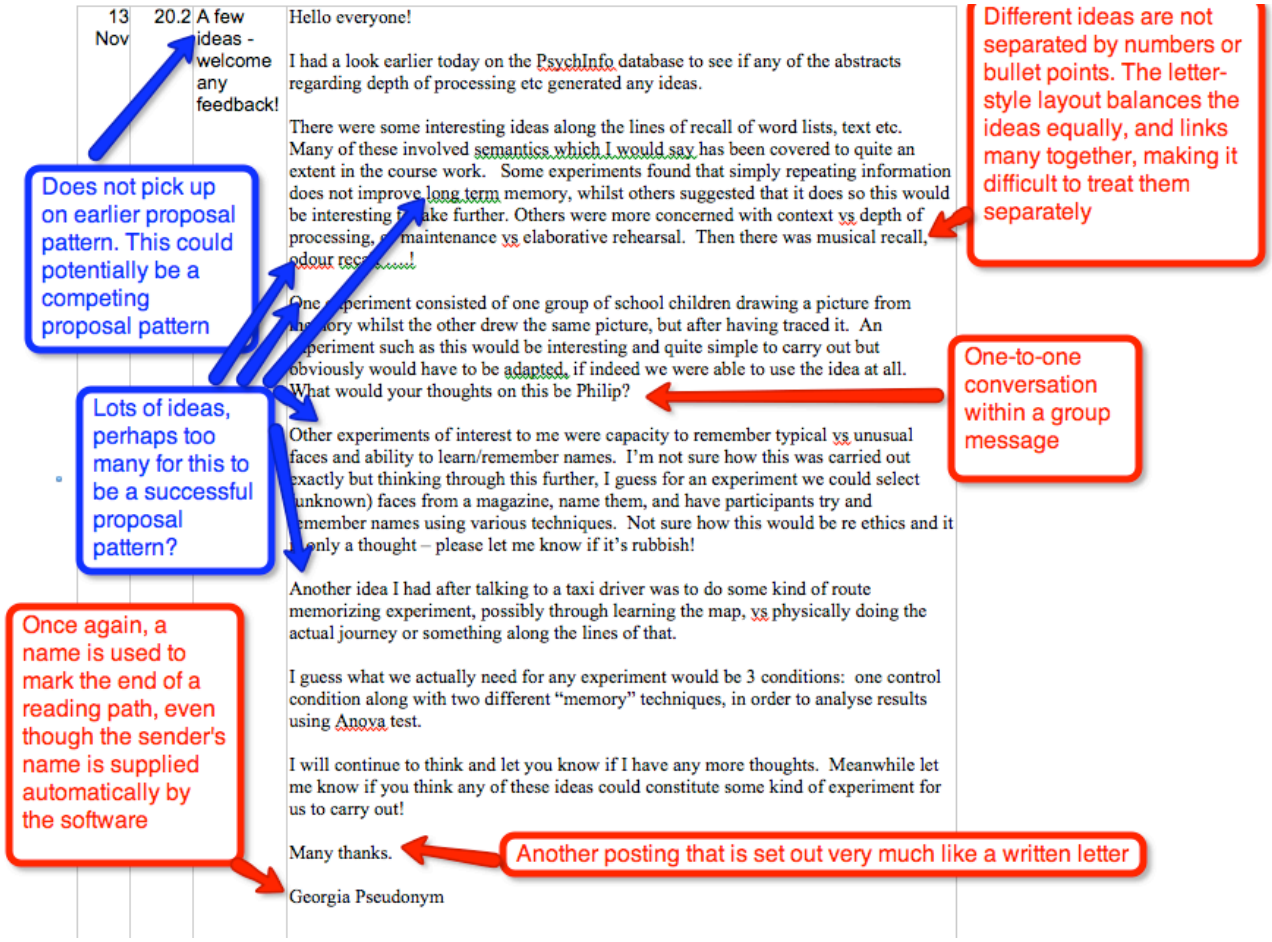

Figure G6: Sapphire conference, posting 12

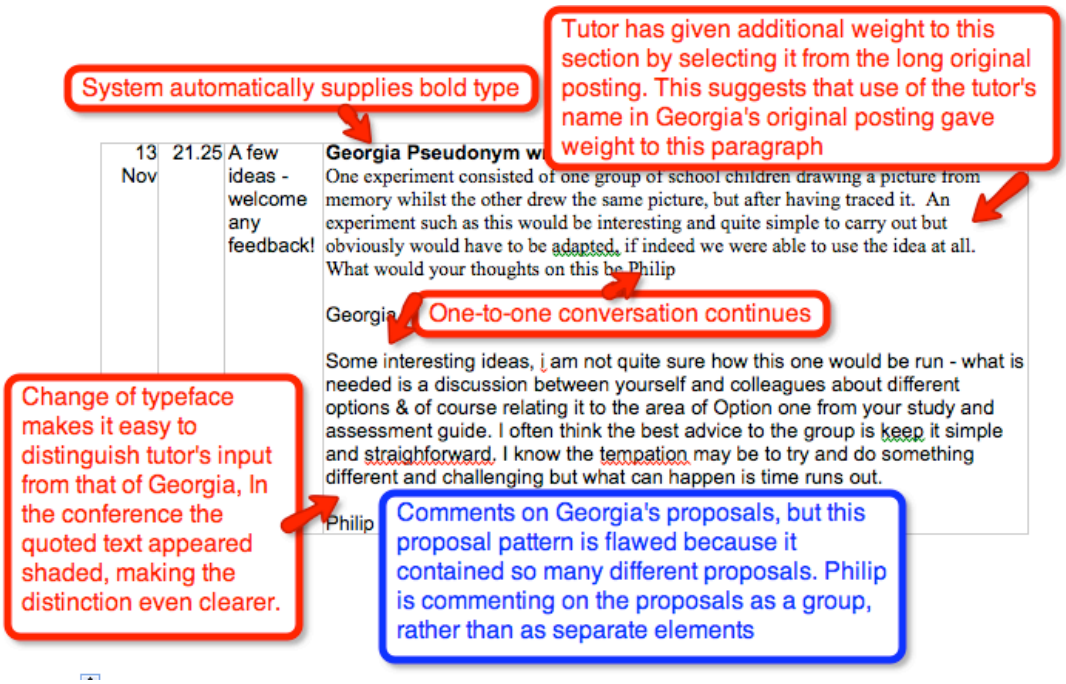

Figure G7: Sapphire conference, posting 13

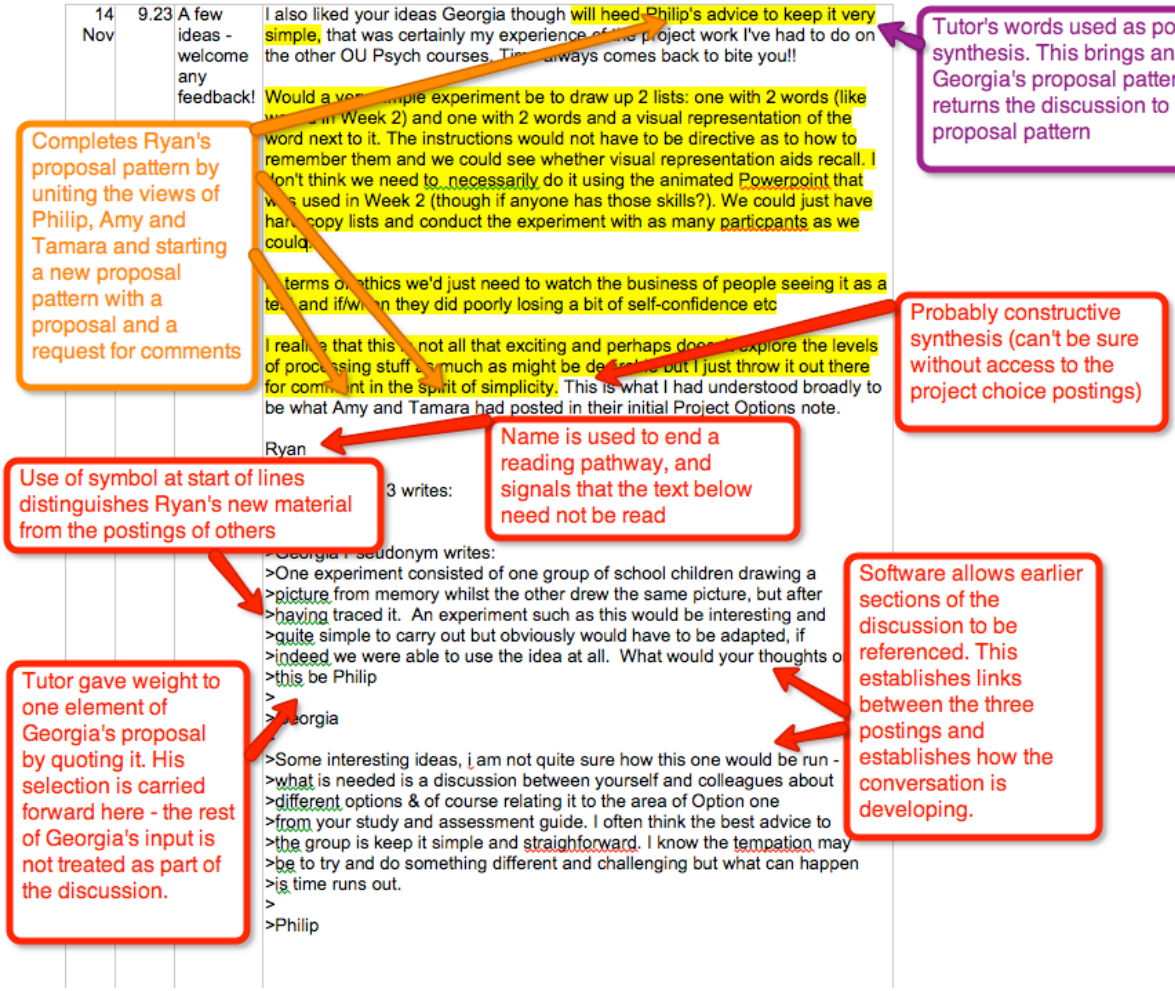

Figure G8: Sapphire conference, posting 14